ZiLOG
Microcontrollers
Products and solutions

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EMBEDDED IN LiFE

eZ80Acclaim Microcontrollers

- 50MHz Flash Microcontroller with on-chip Ethernet MAC
- Z80 compatible mode
- Product brief
- Web server application

Z8Encore! Microcontrollers

- 20MHz, up to 64K flash Microcontroller with ADC, SPI, I^2C, up to 9 UART's, up to 4KB SRAM, 16-bit timers, single pin programming and debug …
- Product brief
- Battery charger application information
- GSM GPRS modems

Z8Encore! MC 8-bit Microcontrollers for motor control

- Product brief
- Motor Control solutions – Large appliances
- Motor Control solutions – Small appliances
- Motor Control solutions – HVAC applications
- Motor Control solutions – Power tools
- Motor Control solutions – 3 phase BDLC motors

Z8Encore! XP Microcontrollers

- 20MHz high performance low power 8-bit Flash microcontrollers with eXtended Peripherals: Analog comparator, T° sensor, Internal Precision Oscillator, current sense amplifier. Up to 8K Flash memory, 128Bytes Non Volatile memory, UART's, PWM's, 8-pin package devices …
- Product brief
- Intelligent battery charging solutions
- Intelligent fan controllers solutions
- Intelligent sensors solutions
- Current measurement for sensor applications

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Z8 GP Microcontrollers

- 8 MHz low cost and low power 8-bit OTP microcontrollers, up to 32KB program memory, 237 Bytes RAM, triple T° range, low and high voltage versions
- Product briefs: : ZGR323L, ZGR163L, ZGP323L, ZGP323H
- Battery level detection solution

ZILOG development tools

- eZ80Acclaim MDS development kit
- eZ80Acclaim Full/Ethernet development kit
- Ethernet mini-module
- ZTP Zilog TCP/IP stack
- Z8 Encore! MCU development kit
- Z8 Encore! XP 4K development kit
- Z8 Encore! XP 8K development kit
- Z8 Encore! XP 8-pin development kit
- MDS Modular Development System GP application board
- Z8 GP ICE and programmer
- ZDSII Zilog Developer Studio - Smart Flash Programmer

Note: All Zilog development kits include full ANSI C-Compiler

eZ80Acclaim!™ Flash Microcontrollers

Product Overview

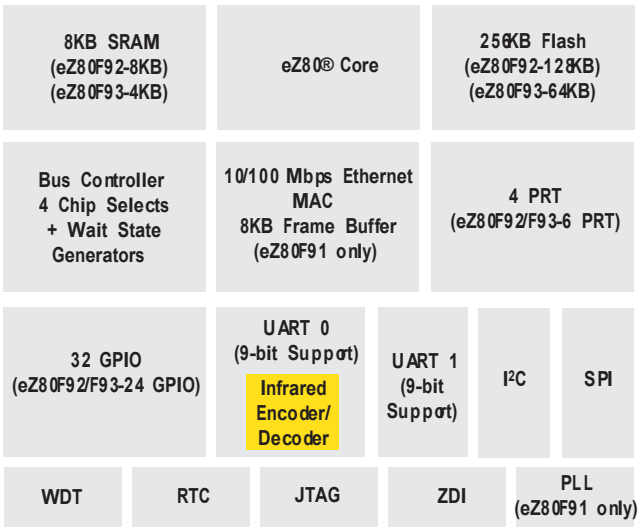
The eZ80Acclaim!™ family of Flash Microcontrollers (MCUs) is the latest addition to ZiLOG's microcontroller line-up offering on-chip Flash memory. With speeds up to 50MHz and an on-chip Ethernet MAC (eZ80F91 only), designers have the necessary performance to execute complex applications quickly and efficiently. Combining up to 256KB of Flash with up to 16KB SRAM, the eZ80Acclaim!™ Flash MCU devices provide the memory needed to implement communication protocol stacks and achieve the flexibility when performing in-system updates of application firmware.

The eZ80Acclaim!™ Flash MCU can operate in full 24-bit linear mode addressing 16MB without a Memory Management Unit. Additionally, support for the Z80-compatible mode allows Z80®/Z180 customers to execute legacy code within multiple 64KB memory blocks with minimum modification. With an external bus supporting eZ80®, Z80®, Intel®, and Motorola® bus modes, designers have several options when interfacing to external devices.

These high performance, 8-bit Flash microcontrollers offer a rich set of serial communication peripherals including two UARTs supporting multi-drop mode, I^2C, SPI, and an IrDA EnDec that facilitates wireless data transfer. In addition, the eZ80F92 and eZ80F93 devices offer a pin-compatible footprint with the eZ80L92 and backwards compatibility to the Z80® and Z180.

Overall, the eZ80Acclaim!™ MCUs are an exceptional value for customers designing high performance, 8-bit MCU-based systems.

eZ80Acclaim!™ Block Diagram



Applications

- Vending Machines
- Point of Sale
- Security
- Automation
- Communication
- Industrial control
- Facility monitoring and remote control

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eZ80Acclaim!™ Flash Microcontrollers

Features/Benefits

- eZ80® core operating at speeds up to 50MHz
  -Achieves high performance
- On-chip 10/100BaseT Ethernet MAC (eZ80F91 only)
  -Enables low-cost network applications
- Up to 256KB on-chip Flash memory with up to an extra 512-byte configuration Flash memory
  -Offers flexibility during development and manufacturing
- Up to 16KB on-chip SRAM
  -Provides ample data space
- Power management features supporting Sleep,Halt and peripherals power-down controls
  -Reduce current consumption
- Glueless external bus supporting eZ80®, Z80®, Intel®, and Motorola® modes
  -Reduces system cost, provides expandability and great flexibility
- Up to 32 General-Purpose I/O pins
  -Rich MCU-like I/Os
- IrDA compatible Infrared Encoder/Decoder
  -Enables wireless data communication
- Two independent UARTs with multidrop mode
  -Support asynchronous communications
- SPI and I^2C Ports
  -Allows synchronous serial communication
- Up to six 16-bit Counter/Timers with I/O capability
  -Manage real-time events and control input and out put ports
- Watchdog Timer with selectable clock inputs
  -Increases system reliability
- Real-time clock with on-chip 32KHz oscillator
  -Maintains real time
- Full-feature PLL (eZ80F91 only)
  -Provides flexible system clocking and power management options
- JTAG and ZiLOG Debug interface (ZDI)
  -Allow in-system debugging and low-cost emulation
- Interrupt controller supports internal and external maskable interrupts as well as non-maskable interupts input
  -Processes real-time events efficiently
- New DMA-like eZ80® instructions
  -Speeds block data transfer

eZ80Acclaim!™ Flash Microcontrollers and Microprocessors

Device	Pin Count	Package	Flash (KB)	External Memory	SRAM (KB)	Speed (MHz)	I/O Lines	Interrupts	16-bit Timers	WDT	PWMs	EMAC	DMA Controller	Other Features	IrDA	POR/ VBO	Operating Voltage	Temp Range	Development Tools
eZ80F91	144	LQFP, BGA	256	16 MB	16	50	32	48	4	✓	4	✓	✓	2 UARTs, SPI, I^2C, PLL, RTC	✓	✓	3.0-3.6V	-40 to 105	eZ80F910200ZCO eZ80F910100KIT eZ80F910SSLKIT eZ80F915050MOD eZ80F915005MOD
eZ80F91 Enet Module	120	2.5x3.1 PCB	256 (Int) 1024 (Ext)	16 MB	16 (Int) 512(Ext)	50	32	48	4	✓	4	✓	✓	2 UARTs, SPI, I^2C, PLL, RTC	✓	✓	3.0-3.6V	-40 to 105	eZ80F910200ZCO
eZ80F91 Mini Module	112	1.9x2.0 PCB	256	16 MB	16 (Int) 128(Ext)	50	32	48	4	✓	4	✓	✓	2 UARTs, SPI, I^2C, PLL, RTC	✓	✓	3.0-3.6V	-40 to 105	eZ80F910100KIT eZ80F910SSLKIT
eZ80F92	100	LQFP	128	16 MB	8	20	24	38	6	✓	-	-	-	2 UARTs, SPI, I^2C, RTC	✓	✓	3.0-3.6V	-40 to 105	eZ80F920200ZCO eZ80F920020MOD eZ80F920120MOD
eZ80F93	100	LQFP	64	16 MB	4	20	24	38	6	✓	-	-	-	2 UARTs, SPI, I^2C, RTC	✓	✓	3.0-3.6V	-40 to 105	eZ80F920200ZCO
eZ80L92	100	LQFP	-	16 MB	-	50, 20	24	37	6	✓	-	-	-	2 UARTs, SPI, I^2C	✓	✓	3.0-3.6V	-40 to 105	eZ80L920210ZCO eZ80L925048MOD
eZ80L92 Enet Module	100	2.5x2.5 PCB	1024	16 MB	512	48	24	37	6	✓	-	✓	-	2 UARTs, SPI, I^2C	✓	✓	3.0-3.6V	0 to 70	eZ80L920210ZCO
eZ80190	100	LQFP	-	16 MB	9	50	32	45	6	✓	-	-	✓	2 UARTs, SPI, I^2C, MACC	-	-	3.0-3.6V	-40 to 105	eZ801900200ZCO

For complete eZ80Acclaim!™ software solutions, visit http://www.zilog.com/products/software

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time!

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eZ80Acclaim!™ Flash Microcontrollers

eZ80F91 Product Brief

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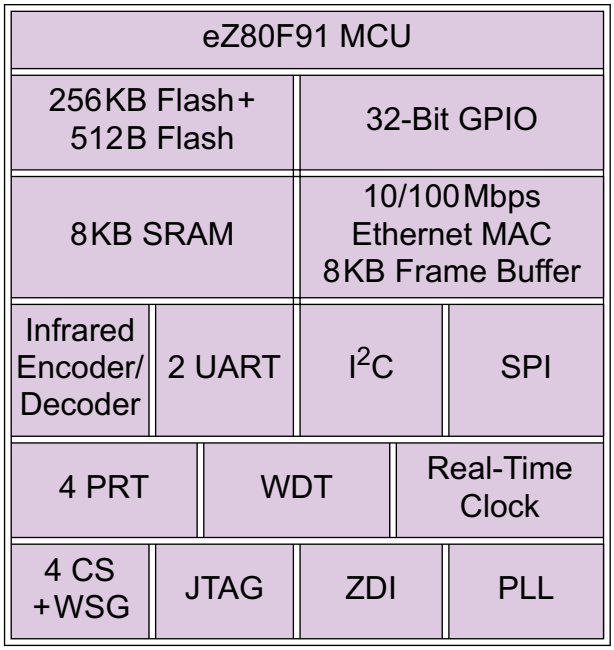
Product Block Diagram



Features

The eZ80F91 microcontroller is a member of ZiLOG's eZ80Acclaim!™ product family, which offers on-chip Flash versions of ZiLOG's eZ80® processor core. The eZ80F91 offers the following features:

- 50MHz High-Performance eZ80® CPU
- 256KB Flash Program Memory plus extra 512B device configuration Flash memory
- 32 bits of General-Purpose I/O
- 16KB total on-chip high-speed SRAM:
  - 8KB for general-purpose use
  - 8KB for 10/100BaseT Ethernet Media Access Controller (EMAC) high-speed frame buffer
- IrDA™-compatible Infrared Encoder/Decoder
- 2 UARTs with independent baud rate generators
- I^2C with independent clock rate generator
- SPI with independent clock rate generator
- Four Counter/Timers with prescalers supporting event counting, input capture, output compare, and PWM modes
- Watch-Dog Timer with internal RC clocking option
- Real-time clock with on-chip 32kHz oscillator, selectable 50/60Hz input, and separate RTC_V_{DD} pin for battery backup.
- Glueless external memory interface with 4 Chip-Selects/Wait-State Generators and external $\overline{WAIT}$ input pin. Supports Intel and Motorola buses.
- JTAG Interface supporting emulation features
- Low-power PLL and on-chip oscillator
- Programmable-priority vectored interrupts, non-maskable interrupts, and interrupt controller
- New DMA-like eZ80® CPU instructions
- Power management features supporting HALT/SLEEP modes and selective peripheral power-down controls
- 144-pin BGA or 144-pin LQFP package
- 3.0–3.6V supply voltage with 5V tolerant inputs
- Operating Temperature Ranges:
  - Standard: 0ºC to +70ºC
  - Extended: –40ºC to +105ºC

General Description

The eZ80F91 device is an industry first, featuring a high-performance 8-bit microcontroller with an integrated 10/100BaseT Ethernet Media Access controller (EMAC). It is a power-efficient, optimized pipeline architecture microcontroller with a maximum operating speed of 50 MHz. Offering on-chip Flash memory, SRAM, Ethernet MAC, and rich peripherals, the eZ80F91 is well-suited for industrial, communication, automation, security, and embedded Internet applications.

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Block Diagram

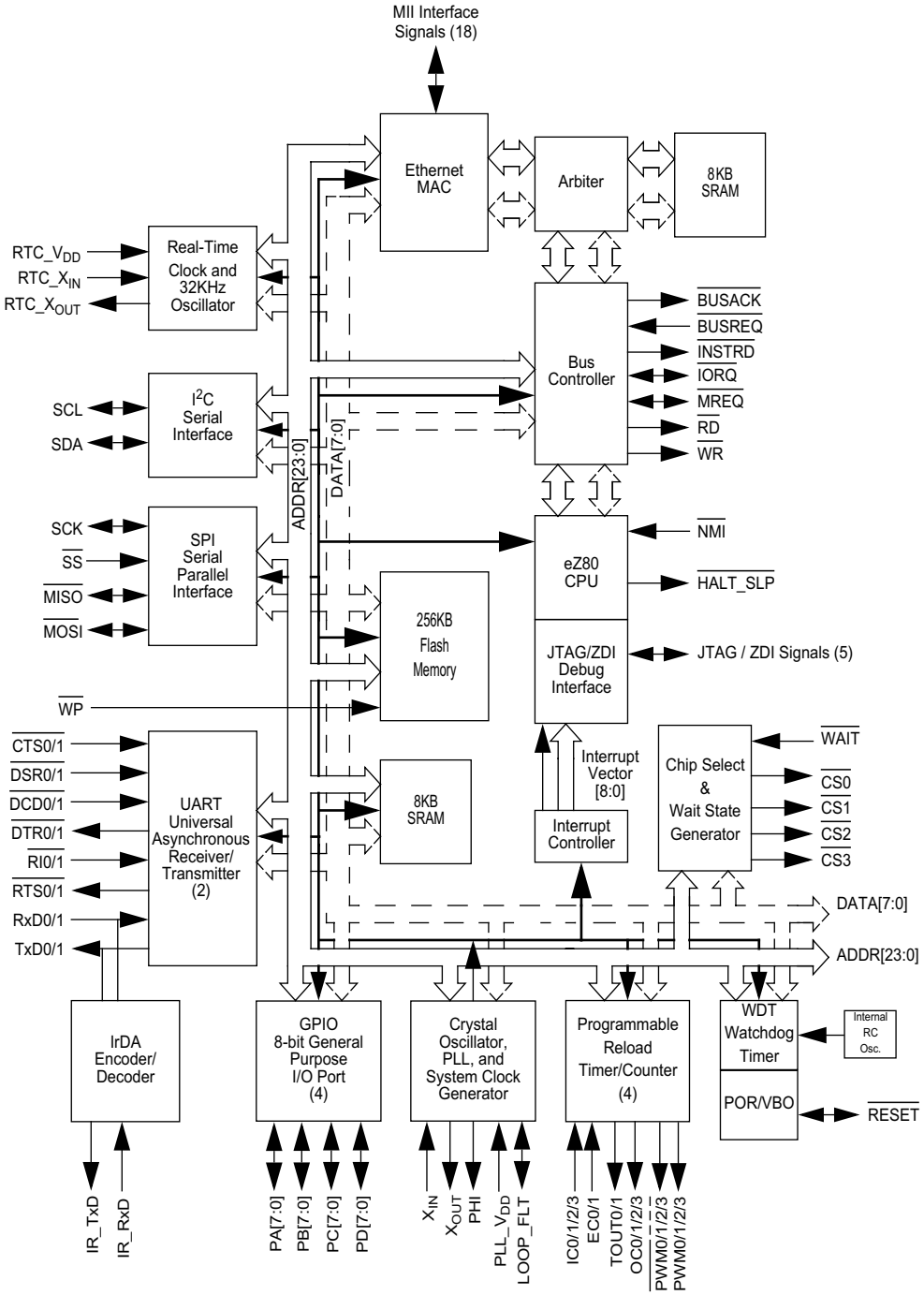
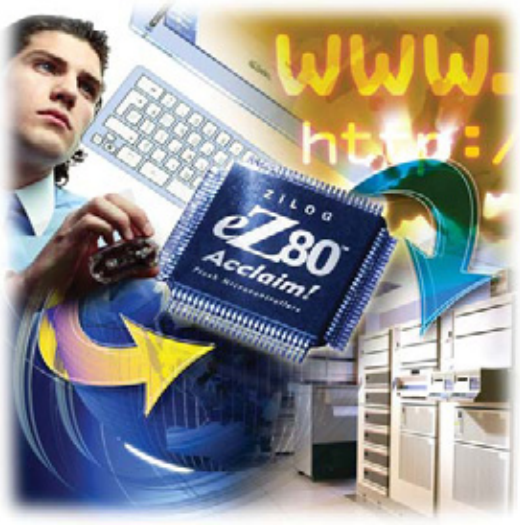


Figure 1. eZ80F91 Block Diagram

ZiLOG Full-Feature TCP/IP Software Suite



ZiLOG TCP/IP STACK FEATURES

- Industry standard, RFC compliant protocols
- Core protocols: IPv4, TCP, UDP, ICMP and ARP
- Additional protocols: HTTP/HTTPS, TFTP, SNMP, TELNET, SMTP, DNS, TIMEP, DHCP/BOOTP, IGMP, RARP, and FTP
- Optional SSL server
- Embedded Flash file system supporting multiple disk volumes and works on available Flash and RAM
- Local or remote runtime debugging OS command shell
- Ethernet, UART, I2C, SPI, RTC, and protocol drivers like PPP and HDLC
- Based on ZiLOG's real-time kernel, RZK with inter-thread communication and synchronization
- Built on ZiLOG's Integrated Development Environment, ZDS II – IDE

APPLICATIONS

- Industrial Control, Facility Automation, Energy Management
- Communication, Embedded Networking Appliances
- POS terminals, Security Panels, Meter and Card Readers

A COMPLETE EMBEDDED INTERNET SOLUTION

ZiLOG's eZ80Acclaim!™ embedded network solution combines a high-performance microcontroller with a turnkey, Flash-based TCP/IP software suite, ZTP. Our TCP/IP solution works in conjunction with the eZ80Acclaim!™ MCU's extensive on-chip network interfaces to provide standard network connectivity in a wide range of applications, such as industrial control, automation, facility management, and remote systems communication. The ZiLOG integrated solution delivers an interoperable network protocol stack, allowing you to concentrate on building your Internet-enabled embedded control applications.

FEATURE-RICH TCP/IP STACK

ZiLOG's TCP/IP software suite is optimized for low-cost systems. Powered by ZiLOG's new real-time kernel RZK, ZTP offers full-feature operating services in addition to network services while occupying little program memory.

ZTP combines a pre-emptive multitasking operating system with the various protocols. Device drivers for Ethernet and serial PPP operations are standard in this comprehensive, field proven package.

The suite's HTTP server can be used to transfer HTML, Java applets/scripts, graphics, and almost any web object in either static or dynamically generated web pages. The HTTP server operates on the eZ80Acclaim!™ platform giving users the ability to monitor and control network-connected appliances and devices. When implemented as an embedded system feature, users can conduct software maintenance and upgrades remotely via a simple browser interface.

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ZiLOG Full-Feature TCP/IP Software Suite

ADVANTAGES

Small Memory Footprint
The full-featured TCP/IP software suite occupies very little program memory. Memory footprint for basic ZTP core protocols is less than 45KB.

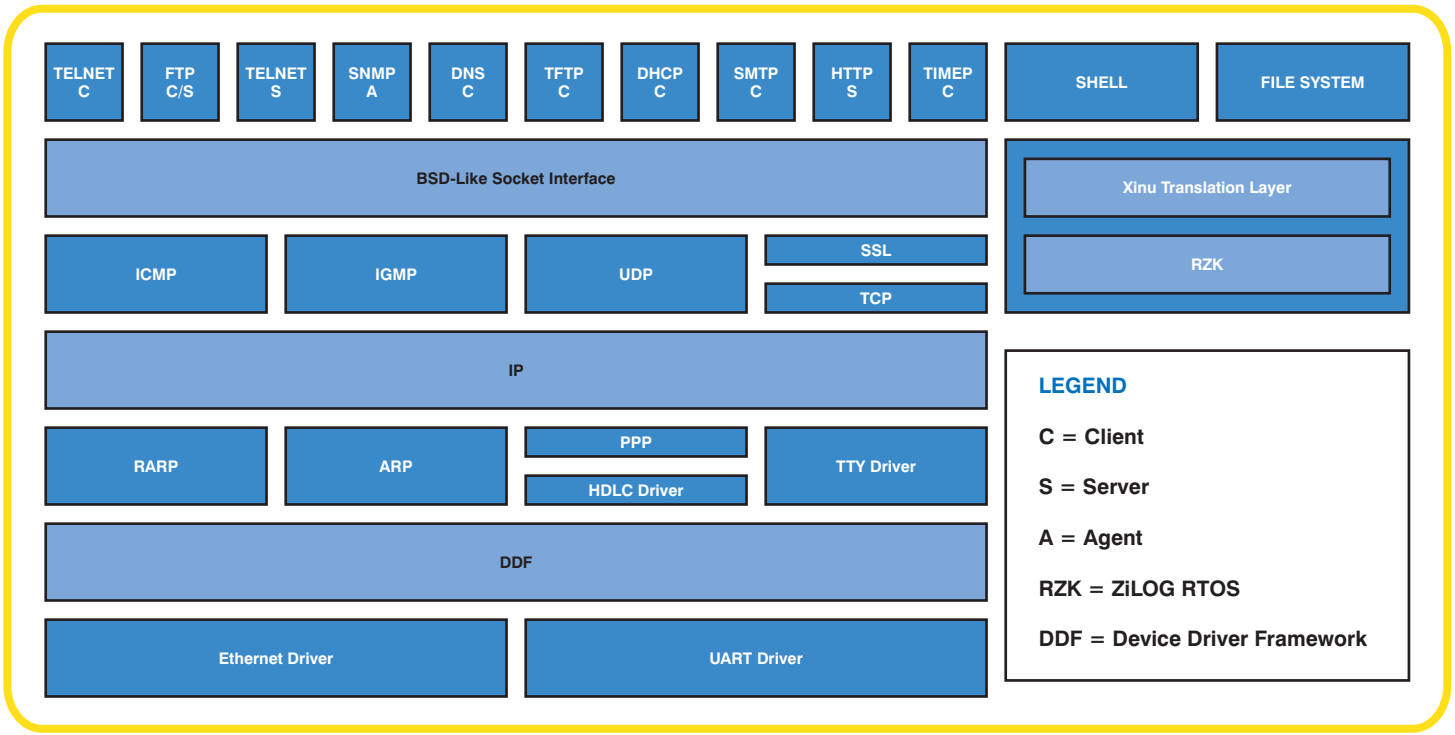
Modular, Scalable, and Configurable
The modular design of ZTP enables the user to include only library objects required by the application, thus saving memory space.

High Performance and Fast Context Switching
ZTP is powered by RZK, which can perform a context switch between threads in less than 12.5 us.

Portable
ZTP applications can be easily migrated to a custom eZ80Acclaim!™-based hardware platform.

Easy to Use and Royalty-Free
User applications can be integrated with ZTP via easy-to-use and well documented Application Programming Interface (API).

- accelerate development time
- shorten the learning process
- maintain backward-compatibility of APIs with previous ZTP releases



ORDERING INFORMATION

Part Number	Description
eZ800000100STO	ZiLOG TCP/IP (ZTP) Object Code
eZ800000100STS	ZiLOG TCP/IP (ZTP) Source Code
eZ800000100PSS	ZTP Network Security SSL Plug-in Option (SSL, HTTPS, US Version)
eZ800000100PTS	ZTP Network Security SSL Plug-in Option (SSL, HTTPS, International Version)
eZ800000100KRO	ZiLOG Real-Time Kernel (RZK) Object Code
eZ800000100KRS	ZiLOG Real-Time Kernel (RZK) Source Code

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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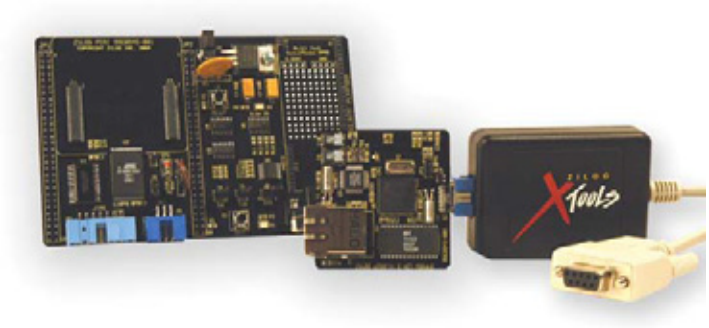
eZ80Acclaim!™ eZ80F91 Modular Development Kit



ZiLOG's eZ80Acclaim!™ eZ80F91 Modular Development Kit provides a general-purpose platform for creating embedded networking designs based on ZiLOG's eZ80F91 microcontroller. The eZ80F91 is a member of ZiLOG's eZ80Acclaim!™ product family, which offers on-chip Flash capability. The eZ80F91 Modular Development Kit features an eZ80F91 Mini Enet Module and an eZ80Acclaim!™ Development Platform onto which the module mounts.

You'll get to market faster with this complete development kit! There's no need to spend precious development time writing your own TCP/IP protocol stack for embedded networking applications. ZTP, ZiLOG's full-feature TCP/IP protocol stack software suite comes free with the purchase of the development kit. We give you a head start on building your network-ready applications.

While the development kit offers complete functionality during design and debugging of end user applications, the eZ80F91 Mini Enet module functions as a standalone add-on module for network-enabling any existing systems, and is available separately. Customers with limited design resources can leverage this proven add-on module for rapid prototyping or production. The general-purpose Development Platform provides all the I/O signals found on the eZ80F91 microcontroller, and further expansion capability to other ZiLOG application boards.

This kit includes ZiLOG's ZDS II Integrated Development Environment for eZ80Acclaim!™ featuring an industry-leading set of tools including a full-feature ANSI C Compiler, assembler, linker, and source-level debugger.

OVERVIEW

- A complete development environment for your innovative embedded networking applications using ZiLOG's award-winning eZ80F91 microcontroller.
- Two-board modular development system (MDS)
    - eZ80F91 Mini Enet Module provides Flash memory and Ethernet Media Access Controller (EMAC), Ethernet PHY, RJ-45 connector, and expansion connectors. Also available separately.
    - eZ80Acclaim!™ Development Platform provides footprint for external Flash memory as well as MDS expansion connectors to other ZiLOG application boards.

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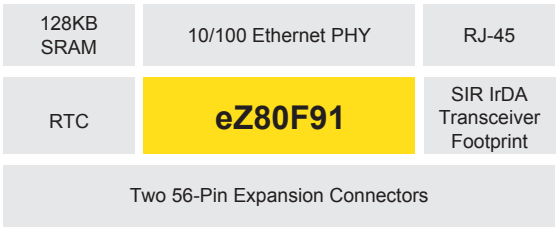
eZ80Acclaim!™ eZ80F91 Modular Development Kit

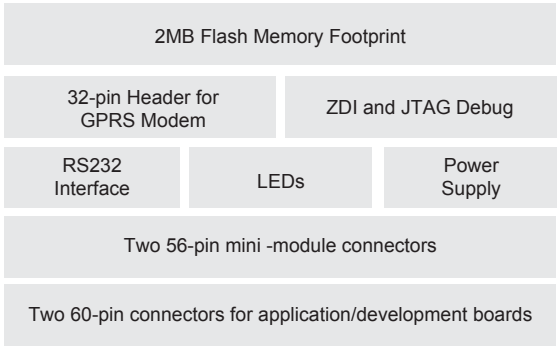
Features

- eZ80F91 Mini Enet Module:
  - eZ80F91 MCU operating at 50 MHz, with 256KB of internal Flash memory and 16KB of internal SRAM memory
  - On-chip Ethernet Media Access Controller (EMAC)
  - 128KB of off-chip SRAM memory
  - Ethernet PHY and RJ-45 port
  - Real-Time Clock, battery capable
  - Footprint for an SIR IrDA transceiver
  - Two 56-pin expansion connectors for attachment to the eZ80Acclaim!™ Development Platform or end-user system
- eZ80Acclaim!™ Development Platform:
  - Footprint for 2M x 8 external Flash memory.
  - RS232 connector with interface circuit for on-chip UART.
  - ZDI and JTAG debug connectors
  - Two 56-pin mini-module connectors
  - Two 60-pin interface connectors for connection to other MDS application boards (not supplied)
  - 32-pin header and footprint for a GPRS modem
  - Power 3.3Volt green LED
  - One yellow Test LED and pushbutton
  - 5VDC external power supply
- Serial RS-232 Smart Debug Cable
- ZDS II integrated development environment with full ANSI C Compiler for the eZ80Acclaim!™ microcontroller family and Documentation CD-ROM
- ZiLOG ZTP TCP/IP protocol stack software suite CD-ROM
- User Manuals, Quick Start Guide, and Schematics for the eZ80F91 Mini Enet Module and eZ80Acclaim!™ Development Platform

eZ80F91 Mini Enet Module



eZ80Acclaim!™ Development Platform



Ordering Information

eZ80F910100KIT	-	eZ80F91 Modular Development Kit
eZ80F910200ZCO	-	eZ80F91 Development Kit
eZ80F915005MOD	-	eZ80F91 Mini Enet Module (included in kit, also sold separately)
eZ80F910SSLKIT	-	eZ80Acclaim!™ Embedded Network Security Kit

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For complete software solutions, visit:
www.zilog.com/products/software

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Z8 Encore!®

High Performance 8-Bit Microcontrollers

OVERVIEW

ZiLOG's Z8 Encore!® family of high performance microcontrollers redefines the 8-bit embedded solutions market. Leading the competition with its robust feature set, this family offers the flexibility and high performance necessary to tackle the demanding applications that design engineers face today.

With up to 64KB of program memory, software code can be changed, updated, and reprogrammed during development and into production. Contributing to this highly integrated design is a 10-bit A/D converter, an on-chip debugger, up to 24 interrupts, and up to 60 general-purpose I/O pins.

High performance is achieved through the Z8 Encore!® MCU's 20MHz CPU core speed. Performance is further enhanced with a 3-channel DMA controller (16-64KB parts only) and up to 4KB of RAM. Additionally, the option of running the I^2C, SPI, and up to two UARTs in parallel, and the inclusion of up to four 16-bit timers with PWM capability, dramatically improves the flexibility provided by this MCU family.

This next generation product, accompanied by an exceptional development tool kit, provides a comprehensive solution for programming needs. Simplify your development process and increase design productivity with ZiLOG's family of Z8 Encore!® microcontrollers. Incorporating into new designs, or upgrading from the existing Z8® architecture, the Z8 Encore!® MCU provides unbeatable value.

FEATURES AND BENEFITS

- New, High Performance eZ8 CPU Core
  Executes code at 20MHz
- Up to 12-channel, 10-bit Sigma-Delta A/D Converter
  Precise measurement of analog signals
- 3-channel DMA (16-64KB parts only)
  Increases performance by allowing direct peripheral-to-memory transfers
- Up to 64KB of Flash/ROM
  Allows for code upgrades anytime during development (or the various product life cycle stages)
- Up to 4KB SRAM
  Offers large data space to accommodate large stacks and data tables
- SPI and I^2C Ports
  Supports both universal serial communication protocols with ability to operate simultaneously
- Up to Two 9-bit UARTs
  Enables full featured serial communications including RS-485 and IrDA Encoder/Decoder
- Up to 24 Interrupts
  Hardware interrupts increase CPU's bandwidth
- Up to Four 16-bit Timers with PWMs
  Multi-mode timers allow for precise measurement of system events
- Single-pin, On-Chip Debugger
  Eliminates need for external debug hardware
- Internal Precision Oscillator (Z8F0xx3 parts only)
  5MHz oscillator eliminates the need for an external oscillator

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Z8 Encore!® High Performance 8-Bit Microcontrollers

Z8 Encore!® MCU Block Diagram

1–64KB Flash	256B-4KB RAM	Up to 12 Channels 10-Bit ADC
Up to four 16-Bit Timers / PMW	**Up to 20MHz eZ8 CPU**	3-Channel DMA Controller*
Watch-Dog Timer with RC Oscillator		POR/VBO & Reset Control
Internal Precision Oscillator*	On-Chip Debugger	Crystal/RC Oscillator
SPI*	I^2C*	2 UARTs with IrDA
Up to 60 General-Purpose I/O Pins		

*Some features not available on all devices

Z8 Encore!® MCU Development Kits

Hardware
- Z8 Encore!® Development Board
- Serial or USB Smart Cable
- 5V DC Universal Power Supply

Software
- ZDS II Integrated Development Environment (IDE)
- ANSI C-Compiler
- Sample Code

Documentation/CD-ROM
- Dev. Kit Quick Start Guide
- Dev. Kit User Manual
- ZDS II - IDE User Manual
- eZ8 CPU User Manual
- Product Specifications
- Product Briefs
- Application Notes

Device	Memory		Core Speed (MHz)	I/O Lines	Interrupts	16-Bit Timers w/ PWMs	10-Bit A/D Channels	DMA Controller	Precision Osc.	SPI and I2C	UARTs	Operating Voltage	Pin Count	Development Kit
	Flash/ ROM (Bytes)	RAM (Bytes)												
Z8F64	64K	4K	20	60	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68,80	Z8F64200100KIT
Z8F48	48K	4K	20	60	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68,80	Z8F64200100KIT
Z8F32	32K	2K	20	46	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68	Z8F64200100KIT
Z8F24	24K	2K	20	46	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68	Z8F64200100KIT
Z8F16	16K	2K	20	46	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68	Z8F64200100KIT
Z8F08	8K	1K	20	19	19	2	5	-	-	✔	1	2.7-3.6V	20, 28	Z8F08200100KIT
Z8F08x3	8K	1K	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F08A28100KIT
Z8F04	4K	1K	20	19	19	2	5	-	-	✔	1	2.7-3.6V	20, 28	Z8F08200100KIT
Z8F04x3	4K	1K	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F04A28100KIT
Z8F02x3	2K	512	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F04A28100KIT
Z8F01x3	1K	256	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F04A28100KIT

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

Z8 Encore! is a registered trademarks of ZiLOG, Inc. in the United States and in other countries. FL000708-0605

ZiLOG

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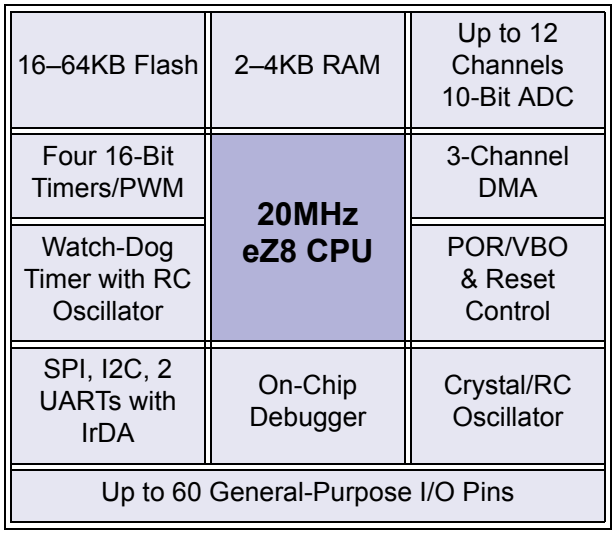
High Performance 8-Bit Microcontrollers

Z8 Encore!® 64K Series

Product Brief

PB012403-0304 PRELIMINARY

Product Block Diagram



Overview

The Z8 Encore!® 64K Series devices are Flash microcontrollers based on the ZiLOG® eZ8 CPU. The Z8 Encore!® 64K Series MCU family of devices sets a new standard for performance and on-chip peripherals.

The Z8 Encore!® 64K Series devices support up to 64KB of Flash (or optional ROM) program memory and 4KB register RAM

The 64K Series devices feature up to twelve channels of 10-bit A/D conversion for measuring analog signals.

These devices include up to four enhanced 16-bit timer blocks featuring PWMs and Capture and Compare.

Up to 24 vectored interrupts with programmable priorities provide increased application flexibility.

The new single-pin debugger and programming interface simplifies code development and allows for easy in-circuit programming.

Two full-duplex UARTs provides serial communications and IrDA encoding and decoding capability.

SPI and I2C ports allow easy incorporation into any system.

Features

- 20MHz eZ8 CPU core
- Up to 64KB Flash memory (or optional ROM) with in-circuit programming capability (Flash only)
- Up to 4KB register RAM
- Up to twelve channels 10-bit analog-to-digital converter (ADC)
- Two full-duplex 9-bit UARTs with bus transceiver Driver Enable Control
- I^2C
- Serial peripheral interface (SPI)
- Infrared Data Association (IrDA)-compliant infrared encoder/decoders
- Up to four 16-bit timers with capture, compare, and PWM capability
- Watch-Dog Timer (WDT) with internal RC oscillator
- 3-channel DMA
- Up to 60 I/O pins depending upon package
- Up to 24 interrupts with configurable priority
- On-Chip Debugger
- Voltage Brown-out Protection (VBO)
- Power-On Reset (POR)
- Crystal oscillator with three power settings and external RC network option

- 3.0–3.6V operating voltage with 5V-tolerant inputs
- 40-, 44-, 64-, 68- and 80-pin packages
- 0° to +70°C standard temperature and -40° to +105°C extended temperature operating ranges

eZ8 CPU Features

- New instructions for improved performance including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT, and SRL
- New instructions support 12-bit linear addressing of the Register File
- Compatible with existing Z8® code
- Up to 10 MIPS operation
- C-Compiler friendly
- 2-9 clock cycles per instruction

Z8 Encore!® 64K Series Development Kit

The Z8 Encore!® 64K Series Development Kit includes the following:

Hardware

- Z8 Encore!® 64K Series Development board
- Smart Cable for PC to Z8 Encore!® 64K Series Development board (DB9 to 6-pin male)
- 5VDC power supply

Software (on CD-ROM)

- ZDS II–Z8 Encore!® IDE with ANSI C-Compiler
- Sample code
- Document Browser
- Acrobat Reader install program

Documentation

- Quick Start Guide
- Registration card
- Z8 Encore!® 64K Series technical documentation (on CD-ROM)
  - Development Kit User Manual
  - ZDS II - IDE User Manual
  - eZ8 CPU User Manual
  - Product specification
  - Product brief
  - Application notes

Architecture

Figure 1 illustrates the Z8 Encore!® 64K Series block diagram.

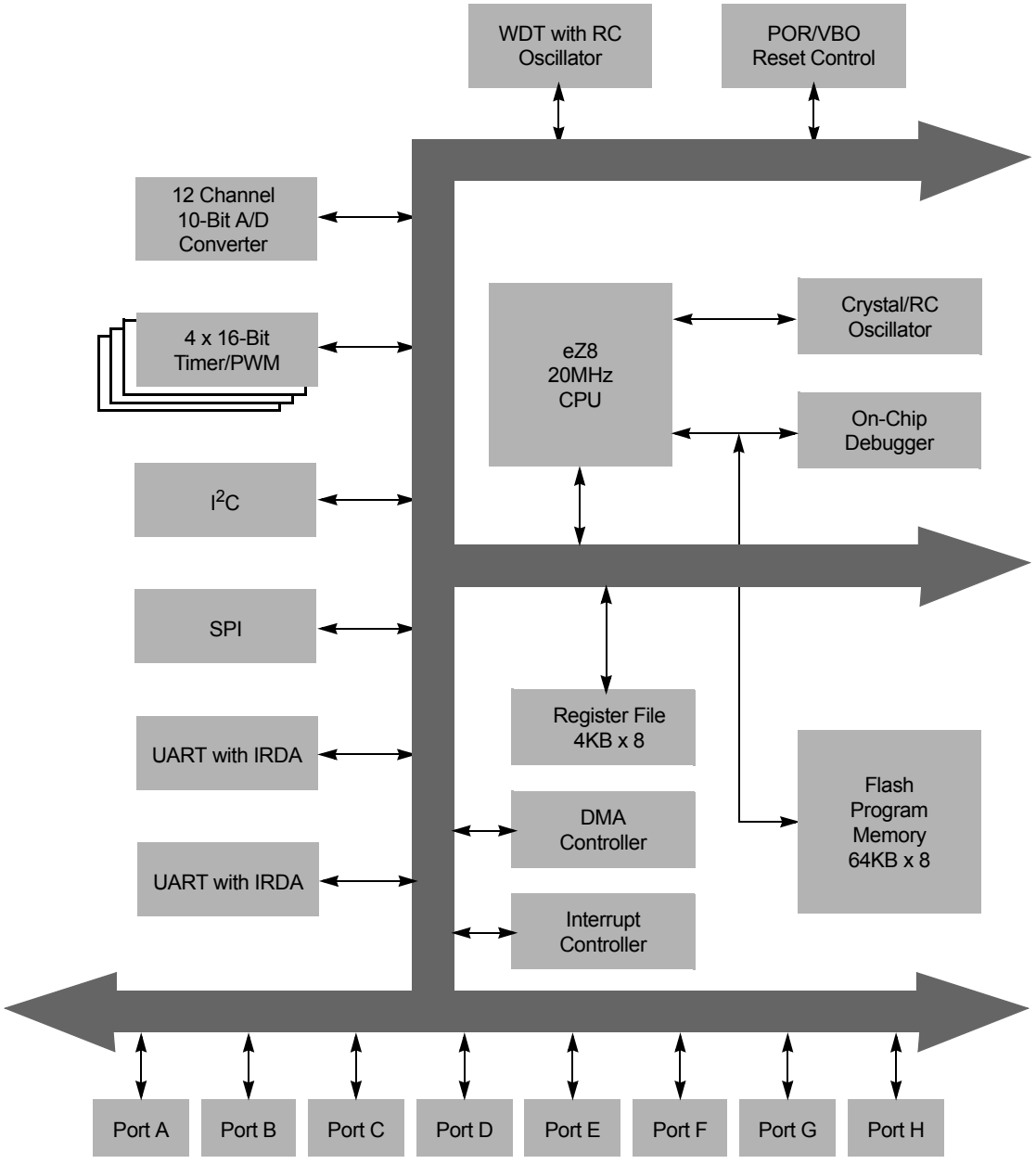


Figure 1. Z8 Encore!® 64K Series Block Diagram

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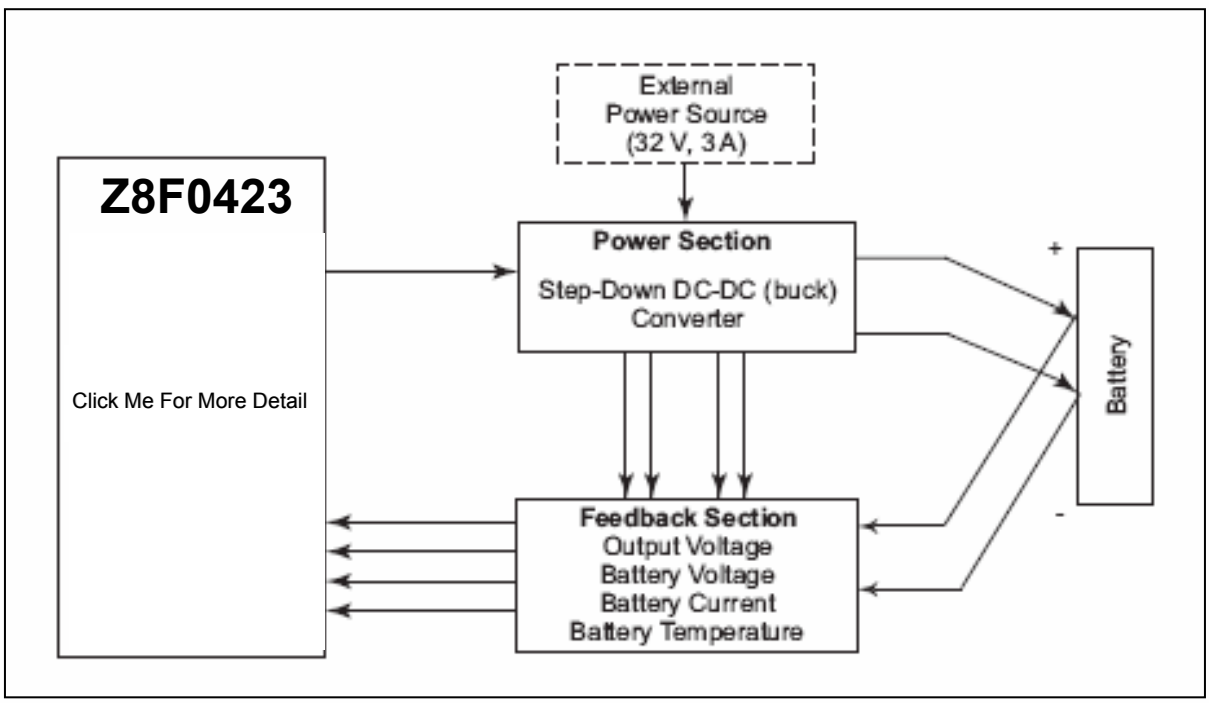
Block Diagram:



Applications Information

Battery Chargers

Ideal Devices: **Z8F0423**
Z8F0223

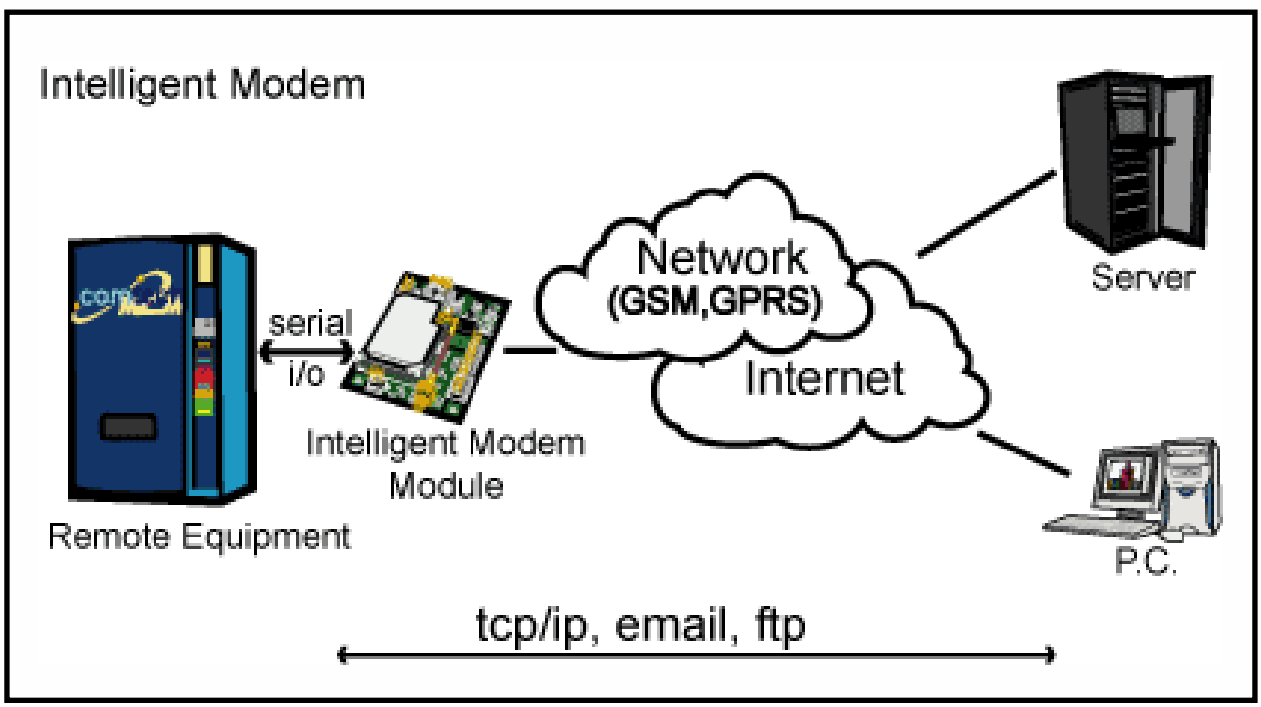
Other possible devices:
Z8F042A
Z8F022A

Key Features Used:

- ***PWM***
- ***Internal Precision Oscillator***
- ***ADC (4 channels @10-bits resolution)***
- ***Flash Program Memory***

More Information:
http://www.zilog.com/docs/z8encorexp/appnotes/an0218.pdf

System Diagram:



Application Information

GSM GPRS Modems

Ideal Devices: **Z8F3202**
Z8F6422

Other possible devices:
Z8F3222
Z8F4822

Key Features Used:

- ***2 Serial Ports (UART's)***
- ***ADC's (upto 12 channels @10-bits)***
- ***Large Flash Program Memory***

2x UARTs device with enough Flash Memory to hold both the custom TCP/IP stack and NVDS for data logging.

This particular application is currently being used in remote lottery terminals at retail outlets in the UK.

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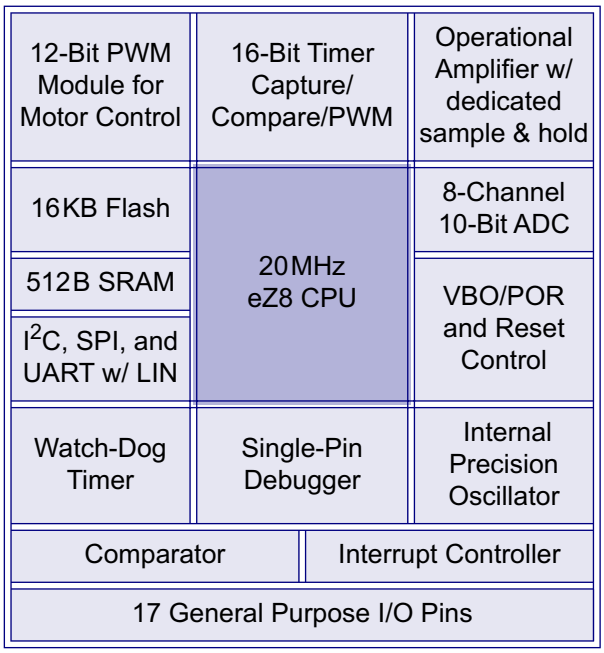
Z8 Encore!® Motor Control Flash Microcontrollers

Z8FMC16100 Series

Product Brief

PB016602-0605

Product Block Diagram



Overview

The Z8FMC16100 Series Flash microcontrollers, a part of the Z8 Encore! MC™ family of motor control devices, are based on ZiLOG's advanced eZ8 8-bit CPU core. Optimized for motor control applications, these devices support the control of single- and multi-phase variable-speed motors. Target applications are large appliances, small appliances, HVAC, automotive, power tools, and personal care devices.

The Z8FMC16100 Series Flash MCUs feature a flexible PWM module with three complementary pairs or six independent PWM outputs supporting dead-band operation and fault protection trip input. These features provide multiphase control capability for a variety of motor types and ensure safe operation of the motor by providing pulse-by-pulse or latched fast shutdown of the PWM pins during fault condition.

The Z8FMC16100 Series MCU features up to eight single-ended channels of 10-bit A/D conversion, with a sample and hold circuit. It also features one operational amplifier for current sampling, with a dedicated sample and hold function controlled by a Motor Control PWM module, and one comparator for over-current limiting or shutdown.

A high-speed ADC enables voltage, current, and back-EMF sensing, while dual-edge interrupts and a 16-bit timer provide a Hall-effect sensor interface.

A full-duplex 9-bit UART provides serial, asynchronous communication and supports the Local Interconnect Network (LIN) serial communications protocol. The LIN bus is a cost-efficient single master, multiple slave organization that supports speeds up to 20Kbps.

Included in its rich set of peripherals are other features such as: one additional 16-bit timer with capture/compare/PWM capability, SPI or I2C Master/Slave for serial communication, and an internal precision oscillator.

The single-pin debugger and programming interface simplifies code development and allows easy in-circuit programming.

Z8FMC16100 Series MCU Features

- 20MHz ZiLOG eZ8 CPU core
- 16KB Flash program memory
- 512B register SRAM
- Fast 8-channel 10-bit analog-to-digital converter for current sampling and back-EMF detection

- 12-bit PWM module with three complementary pairs or six independent PWM outputs with dead-band generation and fault trip input
- One 16-bit timer with capture/compare/PWM capability
- One analog comparator for current limiting or over current shutdown
- One Operational Amplifier and dedicated sample and hold function provides current level-shifting and amplification for ADC current sampling
- I^2C in master, slave, and multimaster modes
- SPI controller
- UART with LIN interface
- Internal precision oscillator (IPO)
- Oscillator supports either internal IPO or external crystals and ceramic resonators
- 17 General Purpose I/O pins (GPIO)
- Voltage Brown-Out/Power On Reset (VBO/POR
- Watch-Dog Timer (WDT) with internal RC oscillator
- Single-pin on-chip debugger
- In-circuit serial programming
- Operating at 2.7 to 3.6 Volts
- 32-pin QFN and LQFP packages
- Lead-free packaging option
- Standard and extended temperature ranges: 0º to 70º (S) and –40º to 105ºC (E)

eZ8 CPU Features

- New instructions for improved performance including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT, and SRL
- Compatible with existing Z8® code
- Up to 10 MIPS operation
- C-Compiler friendly
- 2–9 clock cycles per instruction

Architecture

Figure 1 illustrates the Z8FMC16100 Series MCU block diagram.

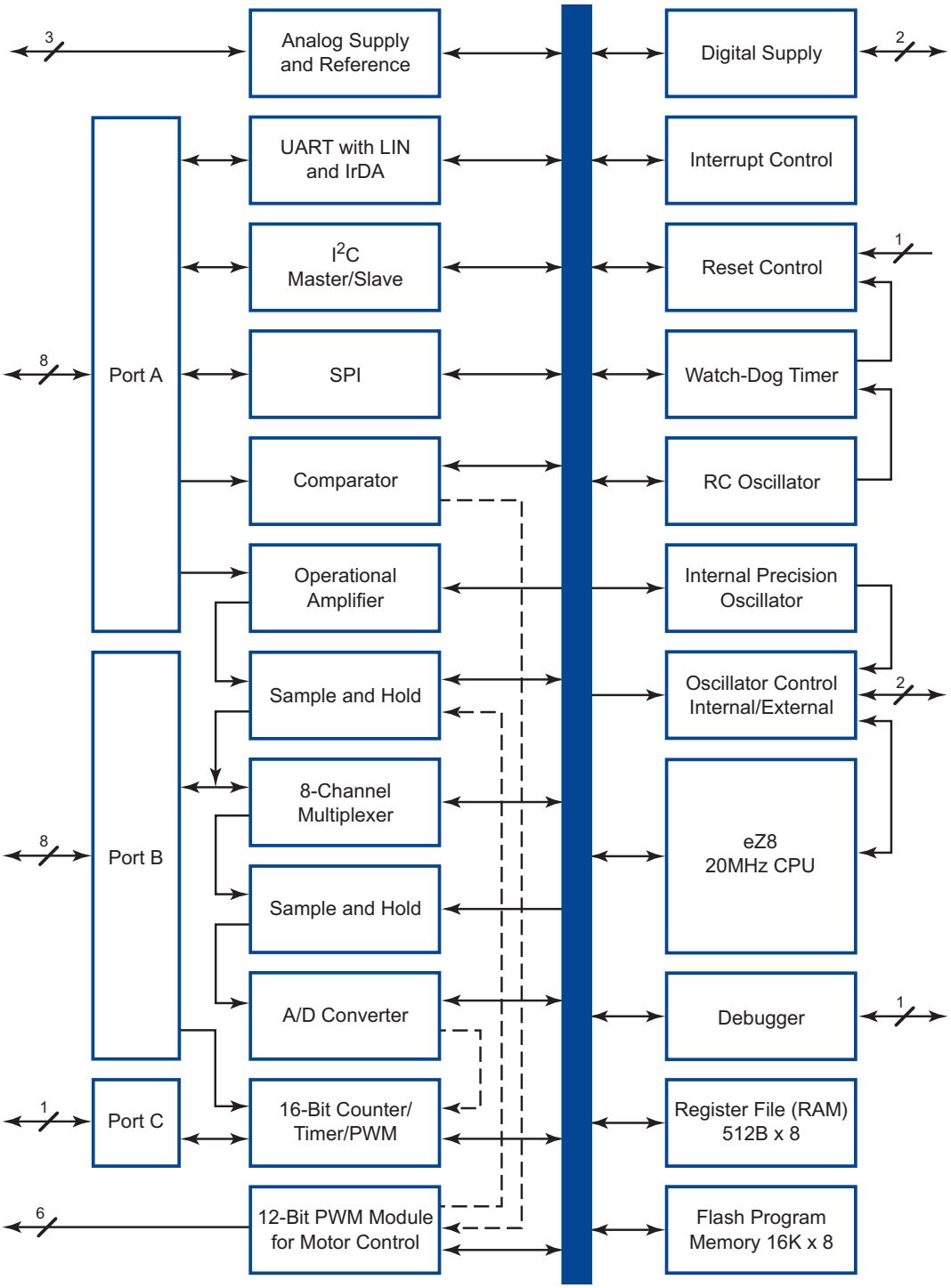


Figure 1. Z8FMC16100 Series MCU Block Diagram

Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

ZiLOG

LARGE APPLIANCES

Z8FMC16100 Series MCU

MOTOR TYPES COMMONLY USED

- Universal
- AC Induction
- Brushless DC (BLDC)
- Switch Reluctance

FEATURES THAT SEPARATE US FROM THE REST

- 8-channel 2µs A/D Converter allows accurate current and back EMF sensing
- Time stamp on ADC sampling for accurate back EMF zero crossing
- Op-amp with external gain settings for current sensing amplification
- Comparator with programmable shutdown for over-current protection
- 3-phase PWM module optimized for motor control
- UART with LIN, SPI, I^2C, communication peripherals
- 2% Internal Precision Oscillator

THE Z8 ENCORE! MC

During the last century, appliances have become an essential part of our lives. While cost savings have been a big focus during this period of time, today's consumers are more interested in the added value an appliance brings to its daily use. ZiLOG's feature-rich Z8 Encore! MC microcontrollers enable today's appliance design engineers to add many new differentiating features and meet the new market requirements. Combined with our easy-to-use development tools, reference designs, and software libraries, the Z8 Encore! MC microcontrollers help you to get to market faster than the competition.

DESIGN CHALLENGES

Energy Efficiency

Our 2µs ADC with time stamp is tied to the PWM module and allows you more accurate control of the motor at lower or variable speeds to reduce power consumption.

Design Robustness

In appliance designs, motor noise can interfere with MCU's operation. With our IPO and noise robustness, the Z8 Encore! MC™ MCU can operate even in the worst of conditions.

Differentiating Features

Microcontroller based design allows for ability to add more complex and differentiating features. With 16K of Flash and 17 GPIO you are able to add many bells and whistles to differentiate your product.

Quiet Operation

Keep your appliance system's audible noise low by using the soft start feature and ability to adjust the speed of the motor by using our advanced analog motor control features.

Communication

Use the advantage of integrated multiple communication peripherals for complete system level communication.

Next page

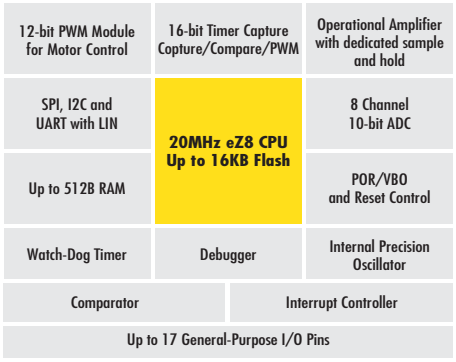
Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

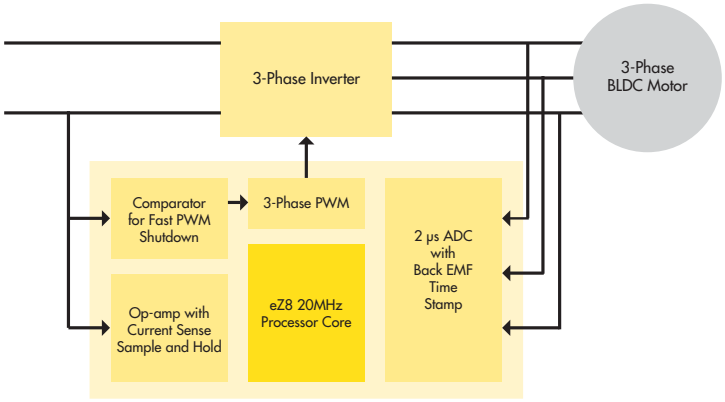
LARGE APPLIANCES

Z8FMC16100 Series MCU

BLOCK DIAGRAM


12-bit PWM Module for Motor Control
16-bit Timer Capture Capture/Compare/PWM
Operational Amplifier with dedicated sample and hold
SPI, I2C and UART with LIN
20MHz eZ8 CPU Up to 16KB Flash
8 Channel 10-bit ADC
Up to 512B RAM
POR/VBO and Reset Control
Watch-Dog Timer
Debugger
Internal Precision Oscillator
Comparator
Interrupt Controller
Up to 17 General-Purpose I/O Pins

SYSTEM DIAGRAM


3-Phase Inverter
3-Phase BLDC Motor
Comparator for Fast PWM Shutdown
3-Phase PWM
2 µs ADC with Back EMF Time Stamp
Op-amp with Current Sense Sample and Hold
eZ8 20MHz Processor Core

MCU FEATURES

20MHz CPU core
Up to 16KB Flash memory
Up to 512B RAM
6-channels of 12-bit PWM with fast shutdown
8-channel 2µs 10-bit ADC with internal reference
Operational amplifier
Analog comparator
Internal Precision Oscillator
UART with LIN, SPI, I^2C
One 16-bit timer
Single-pin debug
Watch Dog Timer (WDT), Voltage Brown Out (VBO), Power On Reset (POR)
32-pin QFN or LQFP
2.7-3.6V operation
Standard (0° to 70°C) and extended (-40° to 105°C) temperature range (125° available upon special request)

REFERENCE TOOLS

Software libraries
Reference designs
Application notes

DEVELOPMENT TOOLS INFORMATION

Z8 Encore! MC™ Z8FMC16100 Series MCU Development Kit is the low cost motor control development tool which contains everything you need to evaluate and design your next motor control project. Includes:

- Brushless DC application board
- Z8FMC16100 series MCU development board
- Opto-isolated USB debugging and programming cable
- ZDS II Integrated Development Environment (IDE) with a full ANSI C compiler

Z8 Encore! MC™ Z8FMC16100 Series MCU In-Circuit Emulator Kit is recommended for more advanced development with trace and event system. 32–pin adapters are available separately.

FOR MORE INFORMATION

Visit us at www.zilog.com or call us at 1(866) GO ZiLOG

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Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

ZiLOG

SMALL APPLIANCES

Z8FMC16100 Series MCU

MOTOR TYPES COMMONLY USED

- Universal
- AC Induction
- Brushed DC
- Brushless DC (BLDC)
- Switch Reluctance

FEATURES THAT SEPARATE US FROM THE REST

- 8-channel 2µs A/D Converter allows accurate current and back EMF sensing
- Time stamp on ADC sampling for accurate back EMF zero crossing
- Op-amp with external gain settings for current sensing amplification
- Comparator with programmable shutdown for over-current protection
- 3-phase PWM module optimized for motor control
- 2% Internal Precision Oscillator

THE Z8 ENCORE! MC

You've set your goals high and your challenge is to bring the best looking small appliance to the market fast without compromising its low cost. Today's consumers expect the best and we help you to give them the best with our Z8 Encore! MC™ family of motor control microcontrollers. We've integrated more features on-chip, thought about the small appliance size, and created a microcontroller that is power efficient and robust enough to be used in harsh environments. Now you are able to add more differentiating features with ease and get your design to market faster at low cost, and these are all the goals that we have set for ourselves.

DESIGN CHALLENGES

Low System Cost

Highly integrated microcontroller features, such as the op-amp and comparator, give you the ability to reduce your overall system cost.

Small Size

Our MCU's feature rich performance is compacted into a 32-pin QFN package requiring only 5x5mm of your PCB space.

Design Robustness

In small appliance designs, motor noise can interfere with MCU's operation. With our IPO and noise robustness, our Z8 Encore! MC™ MCU can operate even in the worst of conditions.

Power Consumption

Our 2µs ADC with time stamp is tied to the PWM module and allows you more accurate control of the motor at lower or variable speeds to reduce power consumption.

Fast Time-to-Market

ZiLOG provides a complete solution for your small appliance motor control design backed by reference designs, software libraries, and application notes to speed you through the design process.

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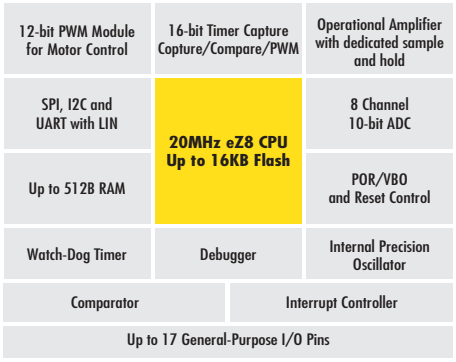
Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

SMALL APPLIANCES

Z8FMC16100 Series MCU

BLOCK DIAGRAM


12-bit PWM Module for Motor Control
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Operational Amplifier with dedicated sample and hold
SPI, I2C and UART with LIN
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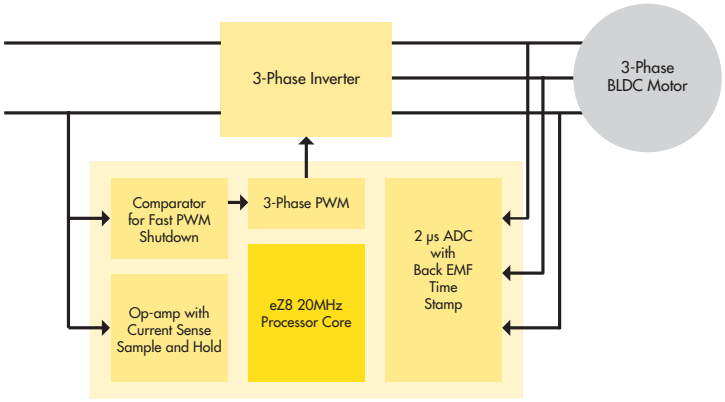
8 Channel 10-bit ADC
Up to 512B RAM
POR/VBO and Reset Control
Watch-Dog Timer
Debugger
Internal Precision Oscillator
Comparator
Interrupt Controller
Up to 17 General-Purpose I/O Pins

SYSTEM DIAGRAM


3-Phase Inverter
3-Phase BLDC Motor
Comparator for Fast PWM Shutdown
3-Phase PWM
2 µs ADC with Back EMF Time Stamp
Op-amp with Current Sense Sample and Hold
eZ8 20MHz Processor Core

MCU FEATURES

20MHz CPU core
Up to 16KB Flash memory
Up to 512B RAM
6-channels of 12-bit PWM with fast shutdown
8-channel 2µs 10-bit ADC with internal reference
Operational amplifier
Analog comparator
Internal Precision Oscillator
UART with LIN, SPI, I^2C
One 16-bit timer
Single-pin debug
Watch Dog Timer (WDT), Voltage Brown Out (VBO), Power On Reset (POR)
32-pin QFN or LQFP
2.7-3.6V operation
Standard (0° to 70°C) and extended (-40° to 105°C) temperature range (125° available upon special request)

REFERENCE TOOLS

Software libraries
Reference designs
Application notes

DEVELOPMENT TOOLS INFORMATION

Z8 Encore! MC™ Z8FMC16100 Series MCU Development Kit is the low cost motor control development tool which contains everything you need to evaluate and design your next motor control project. Includes:

- Brushless DC application board
- Z8FMC16100 series MCU development board
- Opto-isolated USB debugging and programming cable
- ZDS II Integrated Development Environment (IDE) with a full ANSI C compiler

Z8 Encore! MC™ Z8FMC16100 Series MCU In-Circuit Emulator Kit is recommended for more advanced development with trace and event system. 32–pin adapters are available separately.

FOR MORE INFORMATION

Visit us at www.zilog.com or call us at 1(866) GO ZiLOG

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Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

ZiLOG

HVAC APPLICATION

Z8FMC16100 Series MCU

MOTOR TYPES COMMONLY USED

- AC Induction
- Brushless DC (BLDC)

FEATURES THAT SEPARATE US FROM THE REST

- 8-channel 2µs A/D Converter for accurate current and back EMF sensing
- Time stamp on ADC sampling for accurate back EMF zero crossing
- Op-amp with external gain settings for current sensing amplification
- Comparator with programmable shutdown for over-current protection
- 3-phase PWM module optimized for motor control
- UART with LIN, SPI, I^2C communication peripherals
- 2% Internal Precision Oscillator

THE Z8 ENCORE! MC

ZiLOG's high performance Z8 Encore! MC™ 8-bit microcontrollers provide a simple solution for controlling the motors of HVAC systems. Heating, Ventilation, and Air Conditioning (HVAC) industry today is not only concerned with improving the air quality and comfort levels of the consumers, but also trying to meet the demanding energy efficiency standards and ever increasing need for differentiating features. To keep up with these trends, HVAC designs greatly benefit from the advanced features of microcontrollers (MCUs) such as the Z8FMC16100 series of Z8 Encore! MC™ motor control devices.

DESIGN CHALLENGES

Energy Efficiency

Ability to run the motor at slower speeds reduces power consumption. Our 2µs ADC with time stamp is tied to the PWM module and allows you more accurate control of the motor at lower or variable speeds.

Quiet Operation

Keep your HVAC system's audible noise low by using the soft start feature and ability to adjust the speed of the motor by using our advanced analog motor control features.

Design Flexibility

Microcontroller based HVAC design allows for ability to add more complex and differentiating features. With 16K of Flash and 17 GPIO you are able to add many bells and whistles to differentiate your product.

Low System Cost

Highly integrated microcontroller features, such as the op-amp and comparator, give you the ability to reduce your overall system cost.

Communication

Use the advantage of integrated multiple communication peripherals for complete system level communication.

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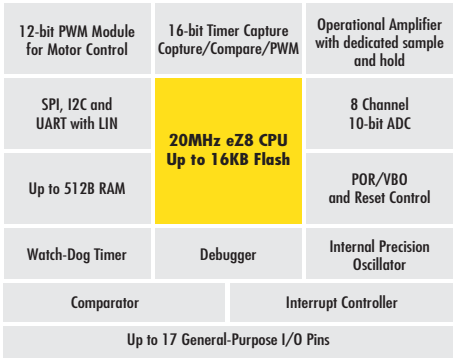
Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

HVAC APPLICATION

Z8FMC16100 Series MCU

BLOCK DIAGRAM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SPI, I2C and UART with LIN
20MHz eZ8 CPU Up to 16KB Flash
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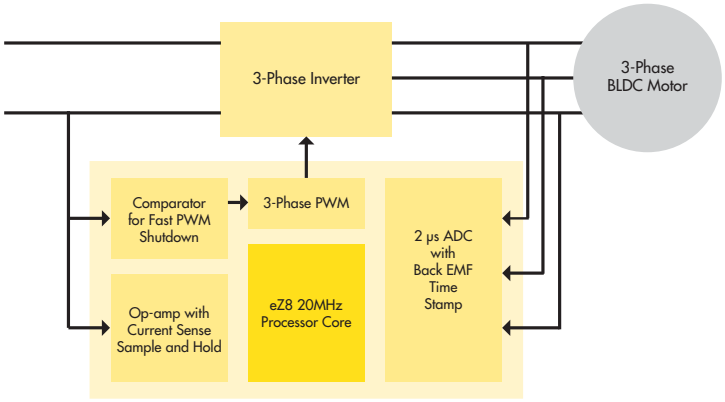
Watch-Dog Timer
Debugger
Internal Precision Oscillator
Comparator
Interrupt Controller
Up to 17 General-Purpose I/O Pins

SYSTEM DIAGRAM


3-Phase Inverter
3-Phase BLDC Motor
Comparator for Fast PWM Shutdown
3-Phase PWM
2 µs ADC with Back EMF Time Stamp
Op-amp with Current Sense Sample and Hold
eZ8 20MHz Processor Core

MCU FEATURES

20MHz CPU core
Up to 16KB Flash memory
Up to 512B RAM
6-channels of 12-bit PWM with fast shutdown
8-channel 2µs 10-bit ADC with internal reference
Operational amplifier
Analog comparator
Internal Precision Oscillator
UART with LIN, SPI, I^2C
One 16-bit timer
Single-pin debug
Watch Dog Timer (WDT), Voltage Brown Out (VBO), Power On Reset (POR)
32-pin QFN or LQFP
2.7-3.6V operation
Standard (0° to 70°C) and extended (-40° to 105°C) temperature range (125° available upon special request)

REFERENCE TOOLS

Software libraries
Reference designs
Application notes

DEVELOPMENT TOOLS INFORMATION

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- ZDS II Integrated Development Environment (IDE) with a full ANSI C compiler

Z8 Encore! MC™ Z8FMC16100 Series MCU In-Circuit Emulator Kit is recommended for more advanced development with trace and event system. 32–pin adapters are available separately.

FOR MORE INFORMATION

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Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

ZiLOG

POWER TOOLS

Z8FMC16100 Series MCU

MOTOR TYPES COMMONLY USED

- Brushless DC (BLDC)
- Universal
- AC Induction

FEATURES THAT SEPARATE US FROM THE REST

- 8-channel 2µs A/D Converter allows accurate current and back EMF sensing
- Time stamp on ADC sampling for accurate back EMF zero crossing
- Op-amp with external gain settings for current sensing amplification
- Comparator with programmable shutdown for over-current protection
- 3-phase PWM module optimized for motor control
- 2% Internal Precision Oscillator

THE Z8 ENCORE! MC

The world wide demand for power tools continues to grow with the accelerating economic activity and improving living standards. Do-It-Yourself and professional markets are demanding more features at lower costs. To help you keep up with these demands, ZiLOG has created a line of microcontrollers dedicated to motor control of devices such as power tools. Our Z8 Encore! MC™ microcontrollers incorporate many features on-chip to help you reduce overall system cost while adding more functionality to your design. For example, our comparator is tied to the PWM module and allows fast overcurrent protection when a power tool's motor suddenly stops, improving the safety of your product. With our easy to use development tools and supporting reference designs and application notes, you can now beat your competition and get to market faster.

DESIGN CHALLENGES

Low System Cost

Highly integrated microcontroller features, such as the op-amp and comparator, give you the ability to reduce your overall system cost.

Small Size

Our MCU's feature rich performance is compacted into a 32-pin QFN package requiring only 5x5mm of your PCB space.

Design Robustness

In small appliance designs, motor noise can interfere with MCU's operation. With our IPO and noise robustness, our Z8 Encore! MC™ MCU can operate even in the worst of conditions.

Safe Operation

With Z8 Encore! MC microcontroller's over-current sense feature, you can incorporate fast shutdown of the motor for anti-kick back or stall detection.

Differentiating Features

With 16K of Flash and 17 GPIO you are able to add many bells and whistles to differentiate your product.

Next page

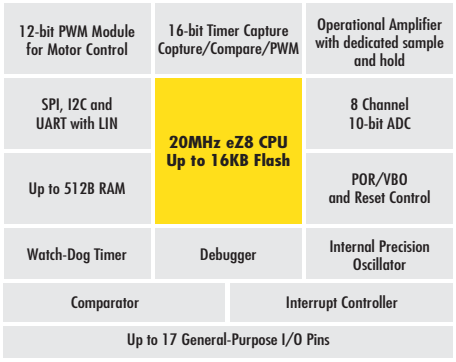
Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

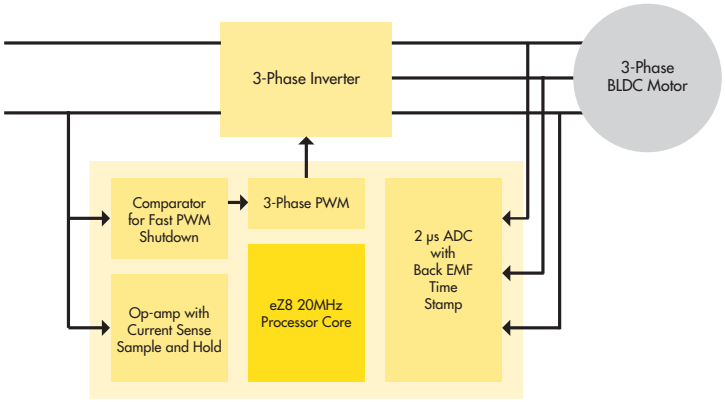
POWER TOOLS

Z8FMC16100 Series MCU

BLOCK DIAGRAM


12-bit PWM Module for Motor Control
16-bit Timer Capture Capture/Compare/PWM
Operational Amplifier with dedicated sample and hold
SPI, I2C and UART with LIN
20MHz eZ8 CPU Up to 16KB Flash
8 Channel 10-bit ADC
Up to 512B RAM
POR/VBO and Reset Control
Watch-Dog Timer
Debugger
Internal Precision Oscillator
Comparator
Interrupt Controller
Up to 17 General-Purpose I/O Pins

SYSTEM DIAGRAM


3-Phase Inverter
3-Phase BLDC Motor
Comparator for Fast PWM Shutdown
3-Phase PWM
2 µs ADC with Back EMF Time Stamp
Op-amp with Current Sense Sample and Hold
eZ8 20MHz Processor Core

MCU FEATURES

20MHz CPU core
Up to 16KB Flash memory
Up to 512B RAM
6-channels of 12-bit PWM with fast shutdown
8-channel 2µs 10-bit ADC with internal reference
Operational amplifier
Analog comparator
Internal Precision Oscillator
UART with LIN, SPI, I^2C
One 16-bit timer
Single-pin debug
Watch Dog Timer (WDT), Voltage Brown Out (VBO), Power On Reset (POR)
32-pin QFN or LQFP
2.7-3.6V operation
Standard (0° to 70°C) and extended (-40° to 105°C) temperature range (125° available upon special request)

REFERENCE TOOLS

Software libraries
Reference designs
Application notes

DEVELOPMENT TOOLS INFORMATION

Z8 Encore! MC™ Z8FMC16100 Series MCU Development Kit is the low cost motor control development tool which contains everything you need to evaluate and design your next motor control project. Includes:

- Brushless DC application board
- Z8FMC16100 series MCU development board
- Opto-isolated USB debugging and programming cable
- ZDS II Integrated Development Environment (IDE) with a full ANSI C compiler

Z8 Encore! MC™ Z8FMC16100 Series MCU In-Circuit Emulator Kit is recommended for more advanced development with trace and event system. 32–pin adapters are available separately.

FOR MORE INFORMATION

Visit us at www.zilog.com or call us at 1(866) GO ZiLOG

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Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

ZiLOG

3-PHASE BLDC MOTORS

Z8FMC16100 Series MCU

MAIN APPLICATIONS

- Heating, ventilation and air conditioning
- Small and large appliances
- Pumps
- Automotive (power steering, seat control)
- Toys
- Compressors and fans
- Industrial drives

FEATURES THAT SEPARATE US FROM THE REST

- 8-channel 2µs A/D Converter allows accurate current and back EMF sensing
- Time stamp on ADC sampling for accurate back EMF zero crossing
- Op-amp with external gain settings for current sensing amplification
- Comparator with programmable shutdown for over-current protection
- 3-phase PWM module optimized for motor control
- 2% Internal Precision Oscillator

THE Z8 ENCORE! MC

Due to their falling costs over the recent years, brushless DC (BLDC) motors have been gaining more market share and are gaining in popularity because of their high efficiency and reliability, small size, and silent operation. ZiLOG's high performance Z8 Encore! MC™ 8-bit microcontrollers provide the advanced electronic features needed to keep your BLDC design competitive in the marketplace today. Accurate motor control and high speed processing while improving energy efficiency and system cost – achieve all that and more with Z8 Encore! MC™ microcontrollers.

DESIGN CHALLENGES

Reliable Sensorless Startup

Accomplish accurate positional feedback in sensorless motor control applications with our fast ADC tied to the PWM module controlled by a distinctive back EMF control algorithm.

High Speed

Our fast ADC and the 20 MHz CPU core provide the processing ability required to run the complex motor control algorithms to support the high speed of BLDC motors.

Accurate Torque Regulation

Integrated op-amp, time stamp, and s/h circuitry provide effective tools to determine your rotor's position and achieve tight torque control.

Energy Efficiency

Ability to run the motor at slower speeds reduces power consumption. Our 2µs ADC with time stamp is tied to the PWM module and allows you more accurate control of the motor at lower or variable speeds.

Quiet Operation

Keep your BLDC motor's audible noise low by using the soft start feature and ability to adjust the speed of the motor by using our advanced analog motor control features.

Next page

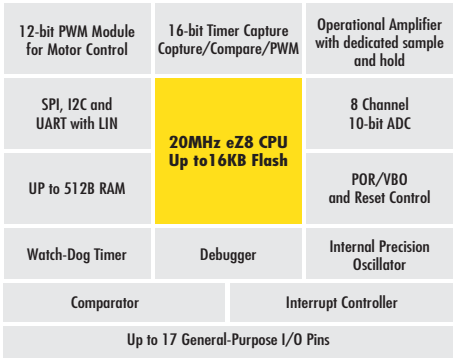
Motor Control Solutions

Z8 Encore! MC™ 8-bit Microcontrollers

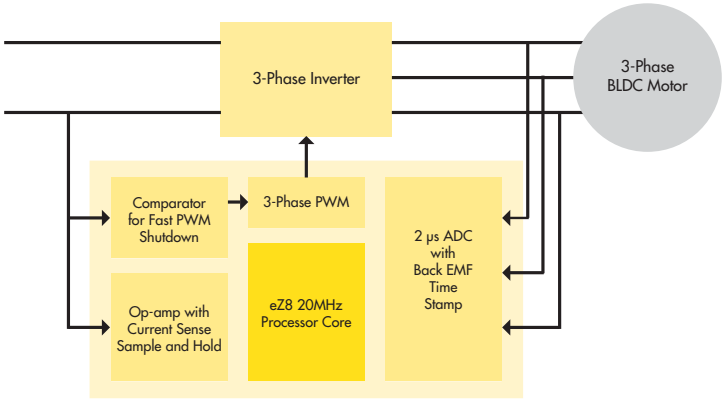
3-PHASE BLDC MOTORS

Z8FMC16100 Series MCU

BLOCK DIAGRAM


12-bit PWM Module for Motor Control
16-bit Timer Capture Capture/Compare/PWM
Operational Amplifier with dedicated sample and hold
SPI, I2C and UART with LIN
20MHz eZ8 CPU Up to16KB Flash
8 Channel 10-bit ADC
UP to 512B RAM
POR/VBO and Reset Control
Watch-Dog Timer
Debugger
Internal Precision Oscillator
Comparator
Interrupt Controller
Up to 17 General-Purpose I/O Pins

SYSTEM DIAGRAM


3-Phase Inverter
3-Phase BLDC Motor
Comparator for Fast PWM Shutdown
3-Phase PWM
2 µs ADC with Back EMF Time Stamp
Op-amp with Current Sense Sample and Hold
eZ8 20MHz Processor Core

MCU FEATURES

20MHz CPU core
Up to 16KB Flash memory
Up to 512B RAM
6-channels of 12-bit PWM with fast shutdown
8-channel 2µs 10-bit ADC with internal reference
Operational amplifier
Analog comparator
Internal Precision Oscillator
UART with LIN, SPI, I^2C
One 16-bit timer
Single-pin debug
Watch Dog Timer (WDT), Voltage Brown Out (VBO), Power On Reset (POR)
32-pin QFN or LQFP
2.7-3.6V operation
Standard (0° to 70°C) and extended (-40° to 105°C) temperature range (125° available upon special request)

REFERENCE TOOLS

Software libraries
Reference designs
Application notes

DEVELOPMENT TOOLS INFORMATION

Z8 Encore! MC™ Z8FMC16100 Series MCU Development Kit is the low cost motor control development tool which contains everything you need to evaluate and design your next motor control project. Includes:

- Brushless DC application board
- Z8FMC16100 series MCU development board
- Opto-isolated USB debugging and programming cable
- ZDS II Integrated Development Environment (IDE) with a full ANSI C compiler

Z8 Encore! MC™ Z8FMC16100 Series MCU In-Circuit Emulator Kit is recommended for more advanced development with trace and event system. 32–pin adapters are available separately.

FOR MORE INFORMATION

Visit us at www.zilog.com or call us at 1(866) GO ZiLOG.

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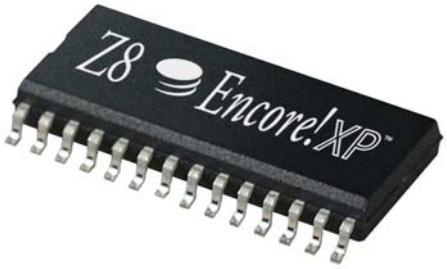
Z8 Encore! XP® F08xA Series

High Performance Microcontrollers with eXtended Peripherals



OVERVIEW

ZiLOG's F08xA series MCUs are high performance 8-bit microcontrollers with an extensive set of on-chip peripherals. Containing a 20 MHz eZ8 CPU core, the F08xA series is based on ZiLOG's user-friendly register to register architecture. The high performance CPU is surrounded by peripherals such as a temperature sensor, transimpedance amplifier, and an internal precision oscillator for advanced application design and faster product development.

The F08xA series MCUs are supported by a development kit which contains everything you need to begin development and create your own Z8 Encore! XP® solution. A full-featured ANSI C compiler is included along with ZiLOG's ZDS II Integrated Development Environment (IDE). A single-pin debugger and programming interface simplifies code development and allows for easy in-circuit programming. Extend your development power with ZiLOG's Z8 Encore! XP® F08xA series microcontrollers today!

FEATURES

- 20 MHz eZ8 CPU core yields 10 MIPS
- 8 KB of Flash with in-circuit programming capability
- 1 KB of RAM
- Up to 8-channel, 10-bit sigma-delta A/D converter with buffered differential input
- On-chip temperature sensor
- Analog comparator
- Transimpedance (current sense) amplifier
- Internal precision oscillator
- Crystal oscillator with three power settings and external RC network option
- Full-duplex 9-bit UART with bus transceiver Driver Enable Control
- IrDA-compliant infrared encoder/decoders
- Two 16-bit timers with capture, compare, and PWM capability
- Watch-Dog Timer (WDT) with internal RC oscillator
- Up to 25 general purpose I/O pins
- Up to 18 interrupts with configurable priority
- On-chip debugger
- Voltage brown-out protection (VBO) and Power-On Reset (POR)
- Programmable low battery detection (8-pin only)
- Oscillator fail detection
- 2.7-3.6V operating voltage with 5V tolerant inputs
- Available in 8-, 20-, and 28-pin packages
- Offered in standard (0° to 70°C) and extended (-40° to 105°C) temperature

ZiLOG

Next page

Z8 Encore! XP® F08xA Series

8KB Flash	1KB RAM	Up to 8 Channels 10-Bit ADC
Two 16-Bit Timers/PWM	**20MHz eZ8 CPU**	Trans-Impedance Amplifier
Watch-Dog Timer with RC Oscillator		POR/VBO & Reset Control
UART with IrDA	On-Chip Debugger	Crystal/RC Oscillator
Temperature Sensor	Analog Comparator	Internal Precision Oscillator
Up to 25 General-Purpose I/O Pins		

8-Pin Development Kit

20, 28-Pin Development Kit

Z8 Encore! XP® F08xA Series MCU Development Kit Contents

Hardware
- Z8 Encore! XP® F08xA Series Development Board
- Serial or USB Smart Cable
- 5V DC Universal Power Supply

Software
- ZDS II Integrated Development Environment (IDE)
- ANSI C-Compiler
- Sample Code

Documentation/CD-ROM
- Development Kit Quick Start Guide
- Development Kit User Manual
- ZDS II - IDE User Manual
- eZ8 CPU User Manual
- Product Specifications
- Product Briefs
- Application Notes

Device	MEMORY Flash (Bytes)	MEMORY SRAM (Bytes)	Speed (MHz)	I/O Lines	16-Bit Timers	10-Bit A/D Channels	UART	Comparator	Other Features	Operating Voltage	Temp. Range (°C)	Pin Count	Development Kit
Z8F081A	8K	1K	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	8 28,20	Z8F04A08100KIT Z8F08A28100KIT
Z8F082A	8K	1K	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	8 28,20	Z8F04A08100KIT Z8F08A28100KIT

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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ZiLOG™

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High-Performance 8-Bit Microcontrollers

Z8 Encore! XP® F08xA Series

with eXtended Peripherals

Product Brief

PB015904-0605 PRELIMINARY

Z8 Encore! XP® Flash Microcontrollers

Product Block Diagram

8KB Flash	1KB RAM	Up to 8 Channels 10-Bit ADC
Two 16-Bit Timers/PWM	**20MHz eZ8 CPU**	Trans-Impedance Amplifier
Watch-Dog Timer with RC Oscillator		POR/VBO & Reset Control
UART with IrDA	On-Chip Debugger	Crystal/RC Oscillator
Temperature Sensor	Analog Comparator	Internal Precision Oscillator
Up to 25 General-Purpose I/O Pins		

Overview

The Z8 Encore! XP® F08xA Series devices are Flash microcontrollers based on the ZiLOG eZ8 CPU. The Z8 Encore! XP® F08xA Series MCU family of devices sets a new standard for performance and on-chip peripherals.

The Z8 Encore! XP® F08xA Series devices support 8KB of Flash program memory and 1KB register RAM

The Z8 Encore! XP® F08xA Series devices feature up to eight single-ended/differential channels of 10-bit A/D conversion with 1x or 20x differential input gain and a transimpedance amplifier for current measurement.

An on-chip temperature sensor allows die temperature measurement over a range of –40º to +105ºC

These devices include two enhanced 16-bit timer blocks featuring PWMs and Capture and Compare.

Up to 18 vectored interrupts with programmable priorities provide increased application flexibility.

The Z8 Encore! XP® F08xA Series features an on-chip Internal Precision Oscillator (5MHz/32KHz) as a trimmable clock source that requires no external components.

The new single-pin debugger and programming interface simplifies code development and allows for easy in-circuit programming.

The full-duplex UART provides serial communications and IrDA encoding and decoding capability.

Features

- 20MHz eZ8 CPU core
- 8KB Flash memory with in-circuit programming capability
- 1KB register RAM
- Up to 8 channels 10-bit analog-to-digital converter (ADC)
- On-chip temperature sensor
- On-chip analog comparator
- On-chip transimpedance (current sense) amplifier
- Full-duplex 9-bit UART with bus transceiver Driver Enable Control
- Infrared Data Association (IrDA)-compliant infrared encoder/decoders

- Two 16-bit timers with capture, compare, and PWM capability
- Watch-Dog Timer (WDT) with internal RC oscillator
- 6–25 I/O pins depending upon package
- Up to 18 interrupts with configurable priority
- On-Chip Debugger
- Voltage Brown-Out Protection (VBO)
- Programmable Low Voltage Detection (LVD), 8-pin only
- Power-On Reset (POR)
- Internal Precision Oscillator (5MHz/32KHz)
- Crystal oscillator with three power settings and external RC network option
- 2.7–3.6V operating voltage with 5V-tolerant inputs
- 8-, 20- and 28-pin packages
- 0º to +70ºC standard temperature and –40º to +105ºC extended temperature operating ranges

eZ8 CPU Features

- New instructions for improved performance including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT, and SRL
- New instructions support 12-bit linear addressing of the Register File
- Compatible with existing Z8® code
- Up to 10 MIPS operation
- C-Compiler friendly
- 2–9 clock cycles per instruction

Z8 Encore! XP® F08xA Series Development Kit

The Z8 Encore! XP® F08xA Series Development Kit includes the following:

Hardware

- Z8 Encore! XP® F08xA Series Development board
- Smart Cable for PC to Z8 Encore! XP® F08xA Series Development board (DB9 to 6-pin male, only 20- and 28-pin kits)
- USB Smart Cable (included in 8-pin kit only)
- USB Smart Cable available for 20- and 28-pin kits as an accessory kit ZUSBSC0100ZAC
- 5VDC power supply

Software on CD-ROM

- ZDS II–Z8 Encore!® IDE with ANSI C-Compiler
- Sample code
- Document browser
- Acrobat Reader® install program

Documentation

- Quick Start Guide
- Registration card
- Z8 Encore! XP® F08xA Series technical documentation (on CD-ROM)
  - Development Kit User Manual
  - ZDS II IDE User Manual
  - eZ8 CPU User Manual
  - Product specification
  - Product brief
  - Application notes

Architecture

Figure 1 illustrates the Z8 Encore! XP® F08xA Series block diagram.

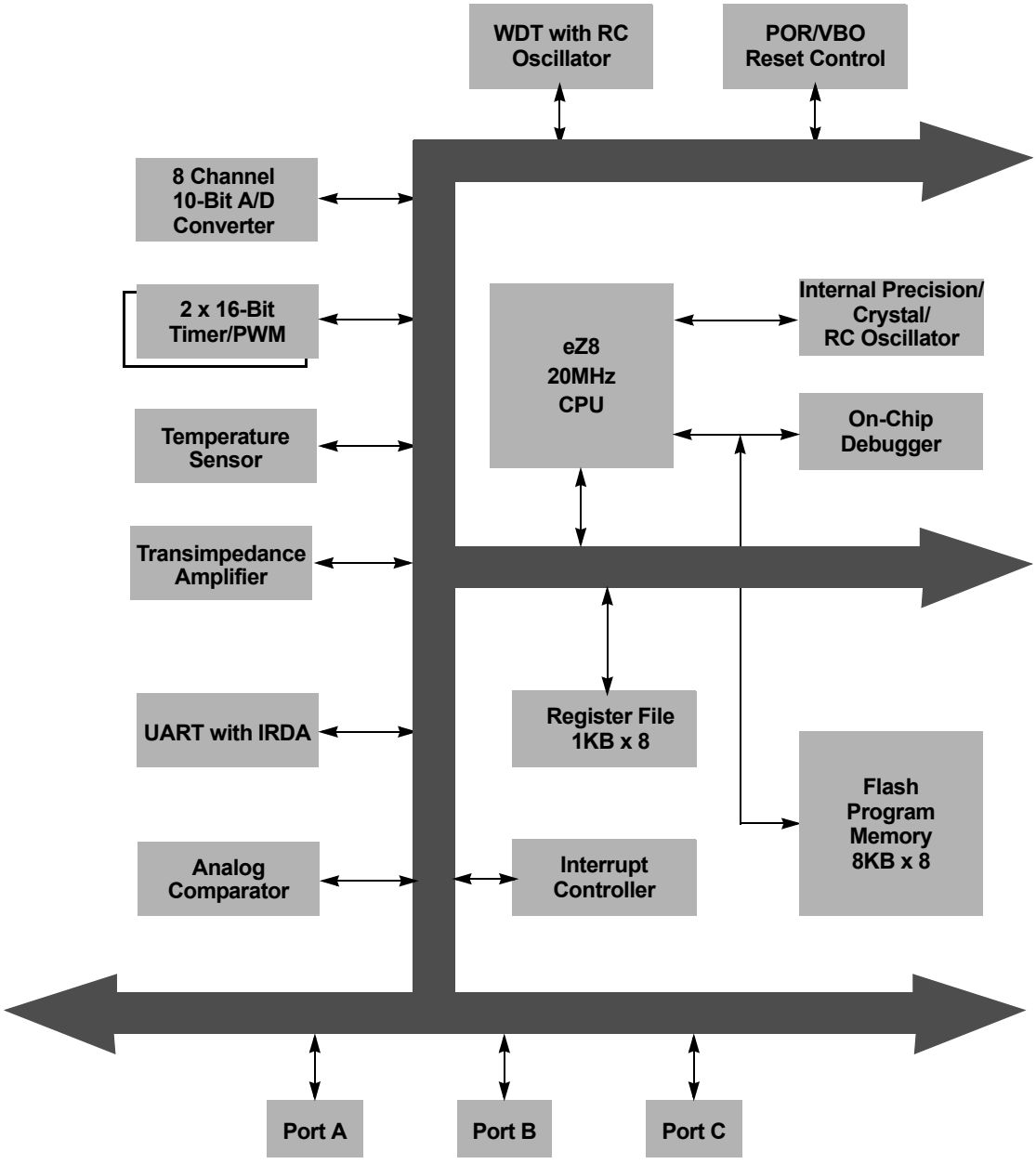

Figure 1. Z8 Encore! XP® F08xA Series Block Diagram

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Z8 Encore! XP® 4K Series

High Performance Microcontrollers with eXtended Peripherals

OVERVIEW

ZiLOG once again delivers a new standard for performance with its Z8 Encore! XP® 4K Series Flash microcontrollers. The Z8 Encore! XP® microcontrollers are based on the ZiLOG eZ8 core and feature an extensive set of on-chip peripherals.

The Z8 Encore! XP® 4K Series devices feature up to eight single-ended/differential channels of sigma-delta 10-bit A/D conversion with 1x or 20x differential input gain and a transimpedance amplifier for current measurement. An on-chip temperature sensor allows die temperature measurement over a range of -40° to +105°C.

Two enhanced 16-bit timer blocks featuring PWMs and Capture/Compare allow you to precisely measure system events. The devices support up to 18 vectored interrupts with programmable priorities, effectively increasing CPU bandwidth and increasing application flexibility. The single-pin debugger and programming interface simplifies code development and allows for easy in-circuit programming, making it possible for you to create designs faster and easier.

When you need peripheral support, you can take advantage of features like the full-duplex UART for serial communications and IrDA encoding/decoding capability. The on-chip Internal Precision Oscillator (5MHz/32KHz) can serve as a trimmable clock source that requires no external components. ZiLOG helped you change the rules with the original Z8 Encore!® Series. Now you can create new rules of your own with the Z8 Encore! XP® 4K Series of Flash microcontrollers.

FEATURES

- 20MHz eZ8 CPU core yields 10 MIPS
- Enhanced instructions support 12-bit linear addressing of the Register File for improved performance, including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT, and SRL
- Up to 4KB of Flash with in-circuit programming capability
- Up to 1KB of RAM and 128B of non-volatile data storage
- Up to 8-channel, 10-bit sigma-delta A/D converter
- On-chip temperature sensor, analog comparator, and transimpedance (current sense) amplifier
- Internal precision oscillator
- Crystal oscillator with three power settings and external RC network option
- Full-duplex 9-bit UART with bus transceiver Driver Enable Control
- Infrared Data Association (IrDA)-compliant infrared encoder/decoders
- Two 16-bit timers with capture, compare, and PWM capability
- Watch-Dog Timer (WDT) with internal RC oscillator
- Up to 25 I/O pins depending upon package
- Up to 18 interrupts with configurable priority
- On-Chip Debugger
- Voltage brown-out protection (VBO) and Power-On Reset (POR)
- 2.7-3.6V operating voltage with 5V-tolerant inputs
- Available in 8-, 20- and 28-pin packages
- Available in standard (0° to 70°C) and extended temperature (-40° to +105°C)

ZiLOG™

Next page

Z8 Encore! XP® 4K Series

1–4KB Flash	256B–1KB RAM	16B–128B NVDS	Up to 8 Channels 10-Bit ADC
Two 16-Bit Timers/PWM	**20MHz eZ8 CPU**		Trans-Impedance Amplifier
Watch-Dog Timer with RC Oscillator			POR/VBO & Reset Control
UART with IrDA	On-Chip Debugger		Crystal/RC Oscillator
Temperature Sensor	Analog Comparator		Internal Precision Oscillator
Up to 25 General-Purpose I/O Pins			

8-Pin Development Kit

20, 28-Pin Development Kit

Z8 Encore! XP® 4K Series MCU Development Kit Contents

Hardware
- Z8 Encore! XP® 4K Series Development Board
- Serial or USB Smart Cable
- 5V DC Universal Power Supply

Software
- ZDS II Integrated Development Environment (IDE)
- ANSI C-Compiler
- Sample Code

Documentation/CD-ROM
- Dev. Kit Quick Start Guide
- Dev. Kit User Manual
- ZDS II - IDE User Manual
- eZ8 CPU User Manual
- Product Specifications
- Product Briefs
- Application Notes

Device	MEMORY			Speed (MHz)	I/O Lines	16-Bit Timers	10-bit A/D Channels	UART	Comparator	Other Features	Operating Voltage	Temp. Range (°C)	Pin Count	Development Kit
	Flash (Bytes)	NVDS (Bytes)	SRAM (Bytes)											
Z8F042A	4K	128	1K	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F041A	4K	128	1K	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F022A	2K	64	512	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F021A	2K	64	512	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F012A	1K	16	256	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F011A	1K	16	256	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT

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ZiLOG

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High-Performance 8-Bit Microcontrollers

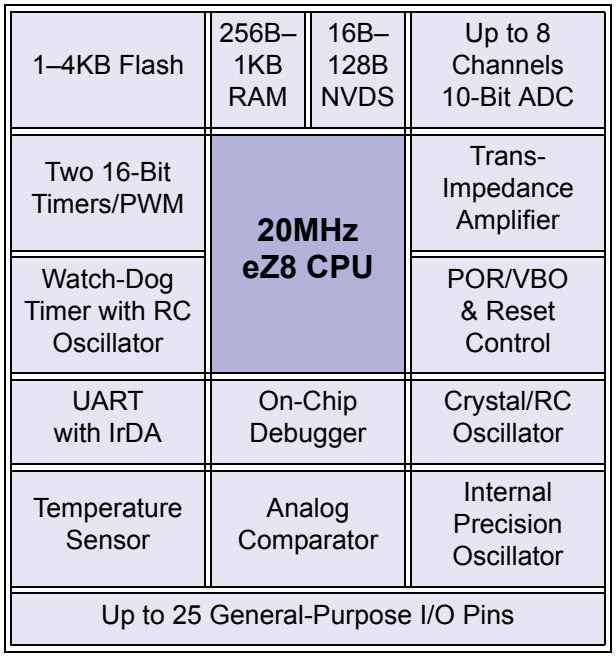
Z8 Encore! XP® 4K Series

with eXtended Peripherals

Product Brief

PB013605-0305 PRELIMINARY

Product Block Diagram



Overview

The Z8 Encore! XP® 4K Series devices are Flash microcontrollers based on the ZiLOG eZ8 CPU. The Z8 Encore! XP® 4K Series MCU family of devices sets a new standard for performance and on-chip peripherals.

The Z8 Encore! XP® 4K Series devices support up to 4KB of Flash program memory and 1KB register RAM

The Z8 Encore! XP® 4K Series devices feature up to eight single-ended/differential channels of 10-bit A/D conversion with 1x or 20x differential input gain and a transimpedance amplifier for current measurement.

An on-chip temperature sensor allows die temperature measurement over a range of –40º to +105ºC

These devices include two enhanced 16-bit timer blocks featuring PWMs and Capture and Compare.

Up to 18 vectored interrupts with programmable priorities provide increased application flexibility.

The Z8 Encore! XP® 4K Series features an on-chip Internal Precision Oscillator (5MHz/32KHz) as a trimmable clock source that requires no external components.

The new single-pin debugger and programming interface simplifies code development and allows for easy in-circuit programming.

The full-duplex UART provides serial communications and IrDA encoding and decoding capability.

Features

- 20MHz eZ8 CPU core
- Up to 4KB Flash memory with in-circuit programming capability
- Up to 1KB register RAM
- Up to 128B Non Volatile Data Storage (NVDS)
- Up to 8 channels 10-bit analog-to-digital converter (ADC)
- On-chip temperature sensor
- On-chip analog comparator
- On-chip transimpedance (current sense) amplifier
- Full-duplex 9-bit UART with bus transceiver Driver Enable Control

- Infrared Data Association (IrDA)-compliant infrared encoder/decoders
- Two 16-bit timers with capture, compare, and PWM capability
- Watch-Dog Timer (WDT) with internal RC oscillator
- 6–25 I/O pins depending upon package
- Up to 18 interrupts with configurable priority
- On-Chip Debugger
- Voltage Brown-Out Protection (VBO)
- Power-On Reset (POR)
- Internal Precision Oscillator (5MHz/32KHz)
- Crystal oscillator with three power settings and external RC network option
- 2.7–3.6V operating voltage with 5V-tolerant inputs
- 8-, 20- and 28-pin packages
- 0º to +70ºC standard temperature and –40º to +105ºC extended temperature operating ranges

eZ8 CPU Features

- New instructions for improved performance including BIT, BSWAP, BTJ, CPC, LDC, LDCI, LEA, MULT, and SRL
- New instructions support 12-bit linear addressing of the Register File
- Compatible with existing Z8® code
- Up to 10 MIPS operation
- C-Compiler friendly
- 2–9 clock cycles per instruction

Z8 Encore! XP® 4K Series Development Kit

The Z8 Encore! XP® 4K Series Development Kit includes the following:

Hardware

- Z8 Encore! XP® 4K Series Development board
- Smart Cable for PC to Z8 Encore! XP® 4K Series Development Board (20 and 28-pin kits)
- USB Smart Cable (included in 8-pin kit only)
- USB Smart Cable available for 20 and 28-pin kits as an accessory kit ZUSBSC0100ZAC
- 5VDC power supply

Software on CD-ROM

- ZDS II–Z8 Encore!® IDE with ANSI C-Compiler
- Sample code
- Document browser
- Acrobat Reader® install program

Documentation

- Quick Start Guide
- Registration card
- Z8 Encore! XP® 4K Series technical documentation (on CD-ROM)
  - Development Kit User Manual
  - ZDSII IDE User Manual
  - eZ8 CPU User Manual
  - Product specification
  - Product brief
  - Application notes

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Architecture

Figure 1 illustrates the Z8 Encore! XP® 4K Series block diagram.

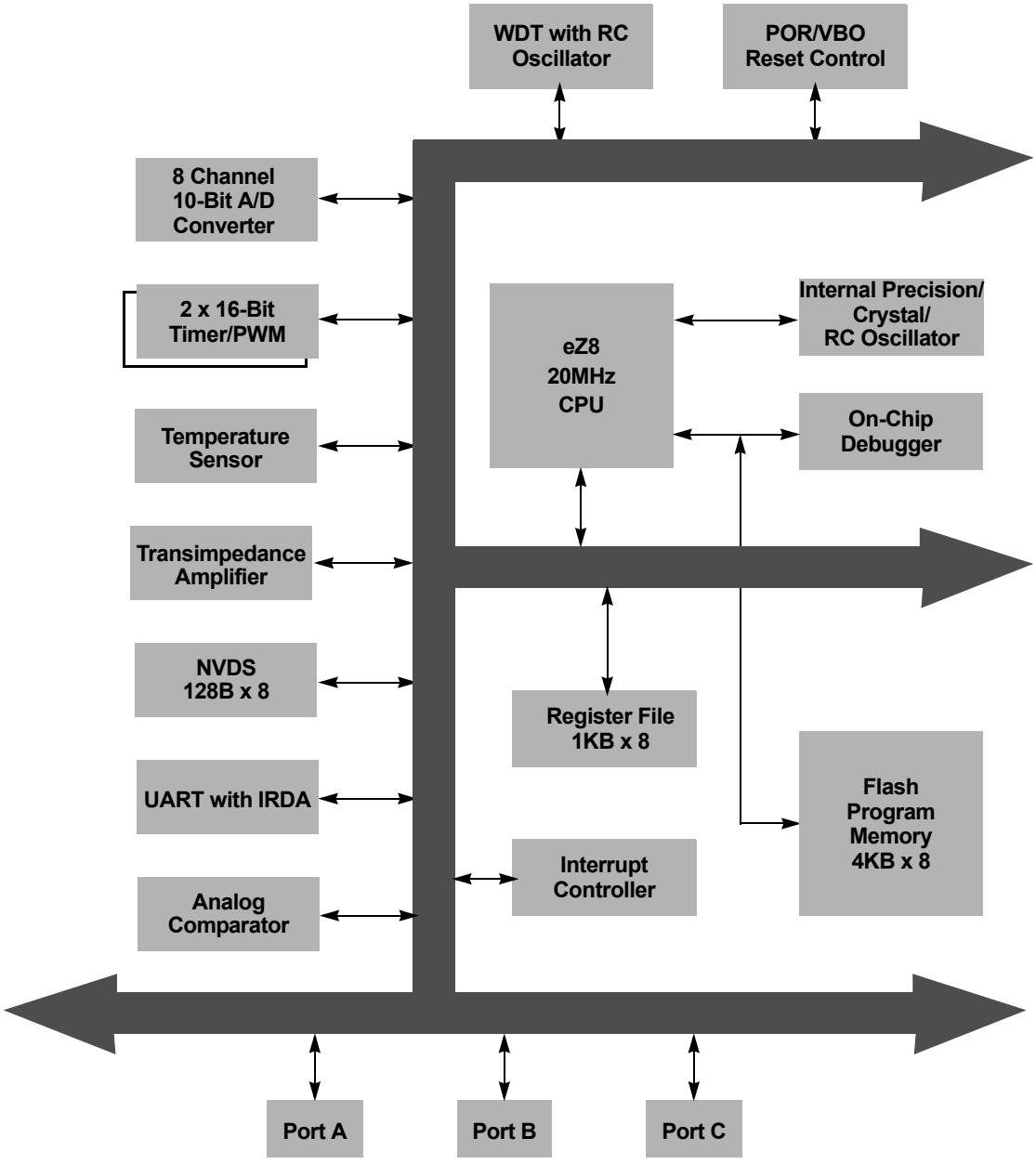

Figure 1. Z8 Encore! XP® 4K Series Block Diagram

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Intelligent Battery Charging Solutions

Z8 Encore! XP® 8-bit Microcontrollers

BATTERY CHARGER APPLICATION

XP FAMILY

BATTERY TYPES COMMONLY SUPPORTED

Consumer electronics products based on:

- Li-Ion (Lithium-Ion)
- NiCd (Nickel-Cadium)
- NiMH (Nickel-Metal-Hydride)

FEATURES THAT SEPARATE US FROM THE REST

- **On-chip integrated transimpedance amplifier (op-amp) for direct measurement of the charging current**
- **8-Channel, 10-bit high resolution A/D converter and two independent PWM outputs that result in two simultaneous charging events, and provide a cost and space saving solution with increased throughput**
- **On-chip integrated analog comparator**
- **Low power consumption in standby modes**

THE Z8 ENCORE! XP® FLASH MICROCONTROLLER

ZiLOG's Z8 Encore! XP Flash microcontrollers offer high-performance and feature-rich peripherals in a portable, yet powerful 8-bit package. No other 8-bit MCU can offer the flexibility of our on-chip integrated, high resolution A/D converter, two independent PWM's, transimpedance amplifier, and temperature sensor in an application-specific, cost-effective solution for intelligent battery charging applications. Add to this an extensive development tool suite and full technical support, and you have a complete embedded control solution that affords a fast design cycle for your end application.

OVERCOMING DESIGN CHALLENGES

Fast Charging and Safety

Fast charging requires constant monitoring of battery parameter and precise charging termination control. The Z8 Encore! XP Flash MCU allows easy switch over from a constant current charge to a constant voltage mechanism for the precise termination of the charging process needed for battery applications. Our MCU also has two independent PWM outputs that provide simultaneous charging of multiple batteries, doubling your system's charging capacity.

The high accuracy ADC on the Z8 Encore! XP prevents overcharging as well. For multiple safety devices to be built into your system, the Z8 Encore! XP multi-channel ADC continuously monitors the output voltage and current of the DC-DC converter, battery charging current, and temperature. The 16-bit timer PWMs will then adjust the output parameters of the DC-DC converter during normal operation and if a fault condition happens.

High System Cost

By integrating advanced features into our MCU, such as the transimpedance amplifier and the temperature sensor, the Z8 Encore! XP doesn't need external components like many of its competitors. Our feature-rich solution gives you the ability to reduce your overall system cost while saving precious board space on your application.

Next page

Battery Charging Solutions

Z8 Encore! XP® 8-bit Microcontrollers

BATTERY CHARGING APPLICATION

XP FAMILY

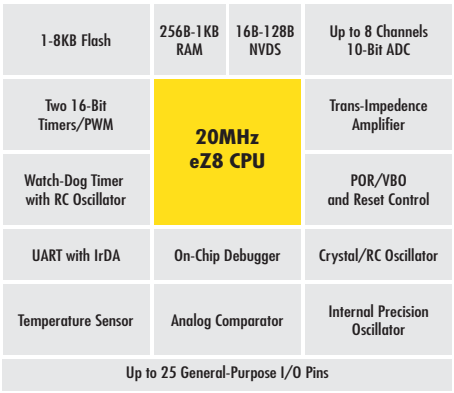
XP SERIES FEATURES

- 20MHz CPU core
- 1, 2, 4, or 8KB Flash memory
- Up to 1KB RAM
- Up to 128B NVDS
- 8-channel 10-bit ADC with internal reference and differential input
- Transamplifier/Operational amplifier
- Internal Precision Oscillator
- Analog comparator
- Temperature Sensor
- UART with IrDA
- Two 16-bit timer PWMs with capture/compare
- Single-pin debug with break and trap
- Single-pin flash programming
- Watch Dog Timer (WDT)
- Voltage Brown Out (VBO)
- Power On Reset (POR)
- 8-, 20-, and 28-pin SOIC, SSOP, QFN, and PDIP packages
- 2.7-3.6V operation
- Standard (0° to 70°C) and extended (-40° to 105°C) temperature range

REFERENCE TOOLS

- Reference designs
- Application notes

BLOCK DIAGRAM



ORDERING INFORMATION

Z8 Encore! XP® Series MCU Development Kits

The low cost development tools which contains everything you need to evaluate and design your next battery charging project. Includes:

- Z8 Encore! XP series MCU development board
- USB debugging and programming cable
- ZDS II Integrated Development Environment (IDE) with a full ANSI C-compiler

FOR MORE INFORMATION

Visit us at www.zilog.com or call us at 1 (866) GO ZiLOG or (408) 558-8500.

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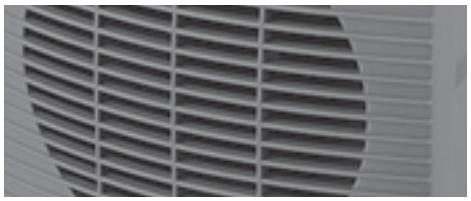
Intelligent Fan Controller Solutions

Z8 Encore! XP® 8-bit Microcontrollers

FAN CONTROLLER APPLICATION



XP FAMILY

FAN TYPES COMMONLY SUPPORTED

- Desktop PC's, Laptops and Servers
- Consumer Electronics Products
- Portable Cooling Devices
- Electronic Cooling and Heating Devices

FEATURES THAT SEPARATE US FROM THE REST

- **On-chip integrated temperature sensor for temperature-based, closed loop control of the fan speed and audible noise**
- **8-Channel, 10-bit high resolution A/D converter and two independent PWM outputs for closed loop control of two fans simultaneously, thereby providing a cost and space saving solution**
- **On-chip integrated analog comparator for detection of a fault condition**
- **Low power consumption in standby modes**

THE Z8 ENCORE! XP® FLASH MICROCONTROLLER

ZiLOG's Z8 Encore! XP Flash microcontrollers offer high-performance and feature-rich peripherals in a portable, yet powerful 8-bit package. No other 8-bit MCU can offer the flexibility of our on-chip integrated temperature sensor, high resolution A/D converter, and two independent PWM's in an application-specific, cost-effective solution for intelligent fan control applications. Add to this an extensive development tool suite and full technical support, and you have a complete embedded control solution that affords a fast design cycle for your end application.

OVERCOMING DESIGN CHALLENGES

Proper Temperature Control & Noise Reduction

ZiLOG's full-feature Z8 Encore! XP with built-in temperature sensor allows temperature regulation in the system without the need for an external sensor. By activating your cooling system with an internal temperature sensor on-chip, your application will run quieter and your system cost will be lower.

Limited Board Space

All of ZiLOG's feature-rich performance is compacted into a small 8-pin SOIC or QFN package (requiring 5x6mm PCB space), so small real-estate requirements are easily met.

Safety

For multiple safety devices to be built into your system, this MCU includes an on-board temperature sensor to ensure proper cooling regulation. It also provides a fast shut down of the PWM via on-chip comparator, which can also be used for stall detection of the motor with a sense resistor.

High System Cost

Highly integrated microcontroller features, such as the transimpedance amplifier and the temperature sensor, give you the flexibility to reduce your overall system cost by reducing the need for more costly external components.

Next page

Fan Controller Solutions

Z8 Encore! XP® 8-bit Microcontrollers

FAN CONTROLLER APPLICATION

XP FAMILY

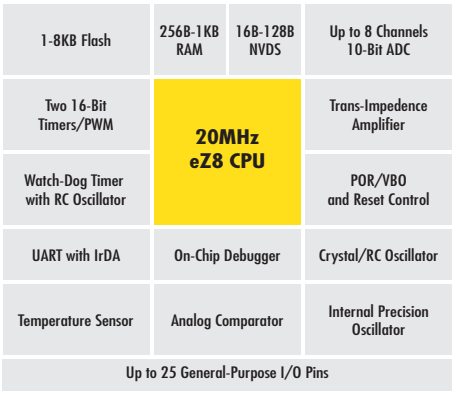
XP SERIES FEATURES

- 20MHz CPU core
- 1, 2, 4, or 8KB Flash memory
- Up to 1KB RAM
- Up to 128B NVDS
- 8-channel 10-bit ADC with internal reference and differential input
- Transamplifier/Operational amplifier
- Internal Precision Oscillator
- Analog comparator
- Temperature Sensor
- UART with IrDA
- Two 16-bit timer PWMs with capture/compare
- Single-pin debug with break and trap
- Single-pin flash programming
- Watch Dog Timer (WDT)
- Voltage Brown Out (VBO)
- Power On Reset (POR)
- 8-, 20-, and 28-pin SOIC, SSOP, QFN, and PDIP packages
- 2.7-3.6V operation
- Standard (0° to 70°C) and extended (-40° to 105°C) temperature range

REFERENCE TOOLS

- Reference designs
- Application notes

BLOCK DIAGRAM



ORDERING INFORMATION

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The low cost development tools which contains everything you need to evaluate and design your next battery charging project. Includes:

- Z8 Encore! XP series MCU development board
- USB debugging and programming cable
- ZDS II Integrated Development Environment (IDE) with a full ANSI C-compiler

FOR MORE INFORMATION

Visit us at www.zilog.com or call us at 1 (866) GO ZiLOG or (408) 558-8500.

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Intelligent Sensor Solutions

Z8 Encore! XP® 8-bit Microcontrollers

SENSOR APPLICATIONS

XP FAMILY

SENSOR TYPES COMMONLY SUPPORTED

- HVAC Temperature control
- CO, Smoke, and heat sensors
- Pressure sensors

FEATURES THAT SEPARATE US FROM THE REST

- **On-chip integrated transimpedance amplifier (op-amp) for direct coupling to the sensor's output current**
- **8-Channel, 10-bit high resolution A/D converter to achieve higher measurement accuracy**
- **On-chip integrated temperature sensor for real-time measurement of the system temperature as well as temperature-based calibration of the sensor output signals**
- **On-chip integrated analog comparator**
- **Low power consumption in standby modes**

THE Z8 ENCORE! XP® MICROCONTROLLER

ZiLOG's Z8 Encore! XP Flash microcontrollers offer high-performance and feature-rich peripherals in a portable, yet powerful 8-bit package. No other 8-bit MCU can offer the flexibility of our on-chip integrated transimpedance amplifier, high resolution A/D converter, and temperature sensor in an application-specific, cost-effective solution for intelligent sensor applications. Add to this an extensive development tool suite and full technical support, and you have a complete embedded control solution that affords a fast design cycle for your end application.

DESIGN CHALLENGES

Accurate Output Signal Measurement

For accurate signal measurement with external gain settings, this MCU has a built-in transimpedance amplifier (op-amp) that allows your sensor interfacing to not be limited by your MCU's fixed amplification. In addition, the high accuracy differential input ADC can provide up to 14-bits of accuracy with software calibration.

Proper Temperature Detection

The built-in temperature sensor on the Z8 Encore! XP can be used to automatically calibrate the processed sensor output, such as the measured CO PPM level, allowing more accurate temperature detection.

Low Battery Life

Using the sleep mode or WDT features, the Z8 Encore! XP MCU can reduce your total power consumption by waking your application, quickly monitoring your results and powering down-all a function of the low stand-by current available on the MCU.

High System Cost

Highly integrated microcontroller features, such as the transimpedance amplifier and the temperature sensor, give you the flexibility to reduce your overall system cost by reducing the need for more costly external components.

Next page

Sensor Interfacing Solutions

Z8 Encore! XP® 8-bit Microcontrollers

SENSOR APPLICATIONS

XP FAMILY

XP SERIES FEATURES

- 20MHz CPU core
- 1, 2, 4, or 8KB Flash memory
- Up to 1KB RAM
- Up to 128B NVDS
- 8-channel 10-bit ADC with internal reference and differential input
- Transamplifier/Operational amplifier
- Internal Precision Oscillator
- Analog comparator
- Temperature Sensor
- UART with IrDA
- Two 16-bit timer PWMs with capture/compare
- Single-pin debug with break and trap
- Single-pin flash programming
- Watch Dog Timer (WDT)
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- 8-, 20-, and 28-pin SOIC, SSOP, QFN, and PDIP packages
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REFERENCE TOOLS

- Reference designs
- Application notes

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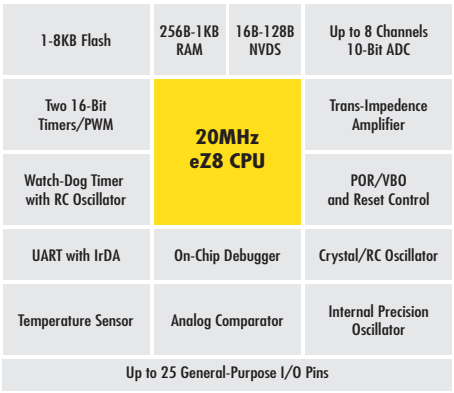

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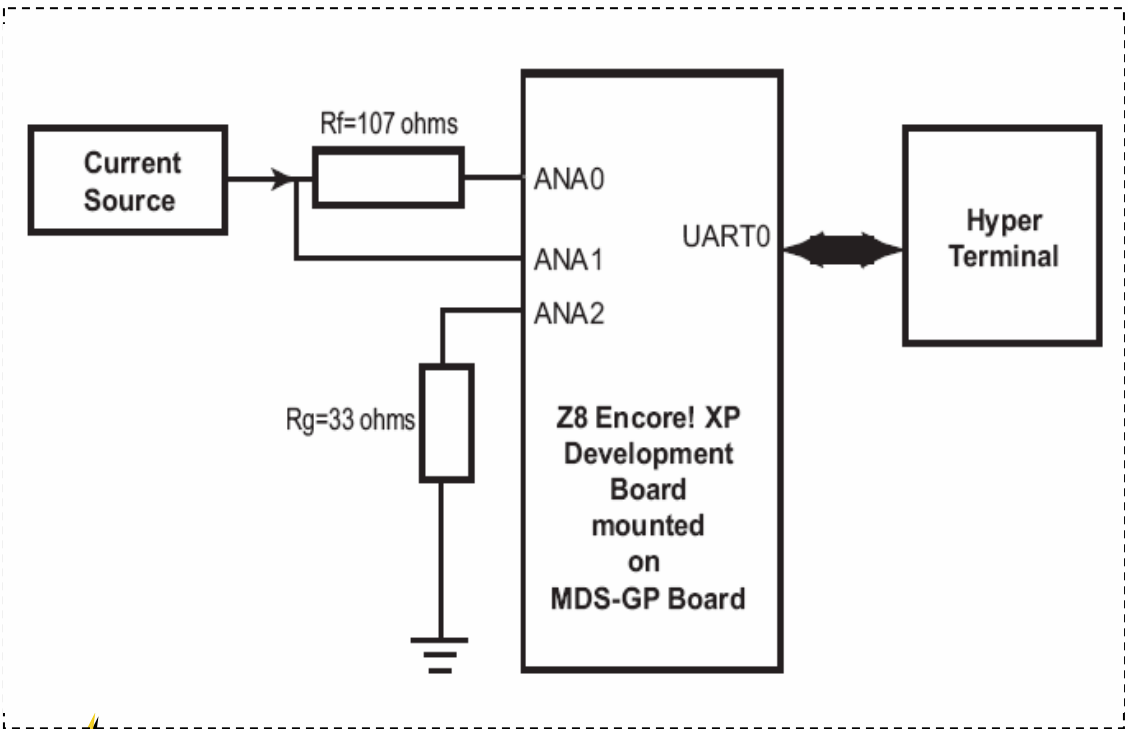
Encore! XP™
Current Measurement for Sensor Applications

WWW.ZiLOG.COM EMBEDDED IN LiFE

Current Measurement Solution from ZiLOG.

- ✓ Ideal for sensor applications
- ✓ Uses onboard ZiLOG Transimpedance Amplifier
- ✓ Low Standby Current MCU (Typ. 1.45uA*)



See the full solution here:
http://www.zilog.com/docs/z8encorexp/appnotes/an0193.pdf

Free! 'C' Compiler

Technical Support Free!

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Z8 Encore!®
MCU Development Kit

OVERVIEW

Get the ZiLOG Z8 Encore!® Microcontroller (MCU) Development Kit today and see how perfectly the Z8 Encore!® MCUs fit into applications such as motor control, security systems, systems onitoring, personal electronic devices, home appliances, and home automation. You'll receive a complete development platform – including all hardware and software – plus a full-version ANSI C-Compiler.

And ZiLOG delivers extra value after you've finished evaluation, because our kit then serves as your complete Z8 Encore!® product development solution. Evaluate, Design, Build – it's that simple. There's nothing else to buy. Discover the value and flexibility Z8 Encore!® MCU brings to your next design. Order your ZiLOG Z8 Encore!® MCU Development kit today!

Z8 Encore!® MCU Development Kit Contents

Hardware
- Z8 Encore!® Development Board
- Serial or USB Smart Cable
- 5V DC Universal Power Supply

Software
- ZDS II Integrated Development Environment (IDE)
- ANSI C-Compiler
- Sample Code

Documentation/CD-ROM
- Development Kit Quick Start Guide
- Development Kit User Manual
- ZDS II - IDE User Manual
- eZ8 CPU User Manual
- Product Specifications
- Product Briefs
- Application Notes

Development Board Features
- Z8 Encore!® MCU
- Three LEDs
- RS-232 interface
- IrDA transceiver
- Two Push Buttons, RESET and TEST
- 5V DC power connector
- On-chip debugger interface
- Header for ADC input (not present on 8-pin board)
- Prototyping area
- External interface connectors
- 2.7-3.6V operating range with 5V tolerant inputs

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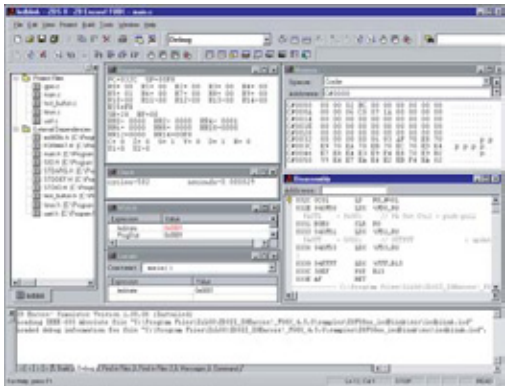
Z8 Encore!® MCU Development Kit



Z8 Encore!® MCU ZDS II IDE GUI

ZiLOG Developer Studio II Integrated Development Environment is a complete suite of software tools that supports development with the Z8 Encore!® MCU. Its easy-to-use Windows-based GUI provides an environment that accelerates the edit, compile, and debug cycle. Included in ZDS II are a language sensitive editor, project manager, compiler, assembler, linker, librarian, and debugger.

C Compiler

A full version ANSI C compiler is included in this kit at no additional cost allowing you to begin your design immediately. The C compiler supports a powerful configurable optimizer allowing code to be optimized for speed or size.

Smart Cable

This small circuit board provides reliable and robust communication between your desktop PC and the development board. Use it for your development board and again with your final product's hardware.

Serial Smart Cable converts RS-232 signals to communicate with the on-chip debugger of the eZ8 core.
P/N: Z8ENCORE000ZAC

USB Smart Cable is compatible with both USB high-speed and full-speed standards and converts the signals sent from the USB port on your development PC to communicate with the on-chip debugger.
P/N: ZUSBSC00100ZAC

Device	Memory		Core Speed (MHz)	I/O Lines	Interrupts	16-Bit Timers w/ PWMs	10-Bit A/D Channels	DMA Controller	Precision Osc.	SPI and I2C	UARTs	Operating Voltage	Pin Count	Development Kit
	Flash/ ROM (Bytes)	RAM (Bytes)												
Z8F64	64K	4K	20	60	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68,80	Z8F64200100KIT
Z8F48	48K	4K	20	60	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68,80	Z8F64200100KIT
Z8F32	32K	2K	20	46	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68	Z8F64200100KIT
Z8F24	24K	2K	20	46	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68	Z8F64200100KIT
Z8F16	16K	2K	20	46	24	4	12	✔	-	✔	2	3.0-3.6V	40,44,64,68	Z8F64200100KIT
Z8F08	8K	1K	20	19	19	2	5	-	-	✔	1	2.7-3.6V	20, 28	Z8F08200100KIT
Z8F08x3	8K	1K	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F08A28100KIT
Z8F04	4K	1K	20	19	19	2	5	-	-	✔	1	2.7-3.6V	20, 28	Z8F08200100KIT
Z8F04x3	4K	1K	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F04A28100KIT
Z8F02x3	2K	512	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F04A28100KIT
Z8F01x3	1K	256	5	24	18	2	8	-	✔	-	1	2.7-3.6V	8 20, 28	Z8F04A08100KIT Z8F04A28100KIT

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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Z8 GP™ MCU Family

Low Cost 8-bit Microcontrollers

Overview

Looking for a low cost 8-bit microcontroller? Look no further. ZiLOG's Z8 GP™ general purpose microcontrollers are offered in a wide range of memory sizes, voltage ranges, and temperature ranges to give you the ability to choose just the right combination of features that your end application requires. Based on the popular Z8® register to register architecture, the Z8 GP™ MCUs will make your design process easy. Development is further simplified by affordable development tools which are easy to use and contain a full version ANSI C Compiler at no additional cost.

Wide Operating Voltage Range

The Z8 GP™ MCU family gives you greater design flexibility. The low-voltage series (ZGP323L, ZGR323L, and ZGR163L devices) support voltage ranges from 2.0 to 3.6V and are ideal for low-power applications. The high-voltage series (ZGP323H devices) operate at 2.0 to 5.5V for applications requiring a wide voltage range.

Multiple Memory Sizes

Z8 GP™ microcontrollers are offered in program memory sizes up to 32KB. One-time programmable (OTP) versions are available in 4KB to 32KB memory sizes and ROM versions are available in 1KB to 32KB memory sizes.

Triple Temperature Range Support

Standard temperature range is recommended for low cost applications requiring a typical 0° to 70°C temperature range. Extended temperature range (-40° to 105°C) is intended for applications under more severe conditions, and automotive temperature range (-40° to 125°C) is the ideal choice for automotive applications.

Features

- Up to 32KB of program memory (EPROM/OTP or ROM)
- Up to 237 Bytes of RAM
- 8MHz CPU core
- Up to 32 General Purpose I/O
- Two independent comparators
- Low voltage (2.0-3.6V) and high voltage (2.0-5.5V) versions
- Low power consumption (6mW typical)
- One 8-bit counter/timer
- One 16-bit counter/timer
- Special counter/timer architecture to automate generation and reception of complex pulses and signals. Includes a programmable input glitch filter.
- Six priority interrupts
- Low Voltage Detection (LVD)
- High Voltage Detection (HVD)
- Watch-Dog Timer (WDT)
- Power-On Reset (POR)
- Multiple temperature ranges:
  - o Standard (0° to +70°C)
  - o Extended (-40° to +105°C)
  - o Automotive (-40° to +125°C)
- Available in SOIC, SSOP, and PDIP packages

ZiLOG

Next page

Z8 GP™ Development Tools

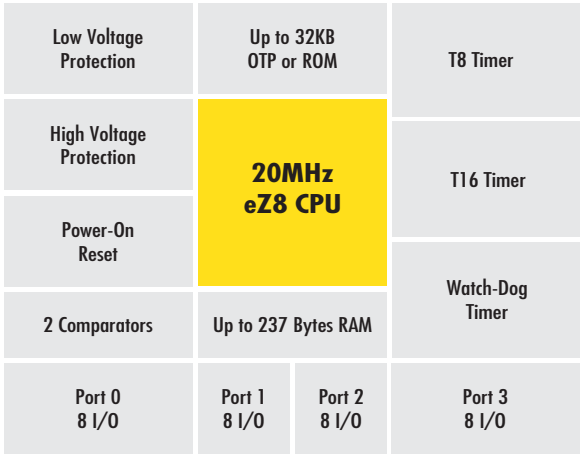
ZiLOG's development tools are designed to be easy to use and to help you bring your innovative designs to market faster. To develop with Z8 GP™ MCUs, get started with one of our low cost Programming Systems or the high end In-Circuit Emulator tool kit.

Our Z8 GP™ Programming Systems provide a complete yet inexpensive solution for development. They are offered with an Ethernet or a USB interface and contain an OTP programming module, package adapters, Z8 GP™ MCU samples in windowed ceramic DIP package, and sample code.

The Z8 GP™ In-Circuit Emulators provide complete Z8 GP™ MCU family chip emulation and include both a trace and event system for ease of debugging in complex applications. An OTP programming module is included with the emulator kits to give you the ability to burn your program onto a Z8 GP™ OTP microcontroller.

Our development tools come with the ZiLOG Developer Studio II Integrated Development Environment (IDE) which includes a full version ANSI C compiler at no additional cost. Combining a Windows-based GUI with multithreading capability, ZDS II provides an environment that streamlines code compilation and development.

Z8 GP™ MCU Block Diagram



Ordering Information

Silicon

ZGP323L	Z8 GP™ ZGP323 Low Voltage OTP Series (2.0-3.6V, 4KB to 32KB)
ZGP323H	Z8 GP™ ZGP323 High Voltage OTP Series (2.0-5.5V, 4KB to 32KB)
ZGR163L	Z8 GP™ ZGP163 Low Voltage ROM Series (2.0-3.6V, 1KB to 16KB)
ZGR323L	Z8 GP™ ZGP163 Low Voltage ROM Series (2.0-3.6V, 4KB to 32KB)

Development Tools

ZGP32300100ZPR	Z8 GP™ ZGP323 Ethernet Programming System
ZGP32300200ZPR	Z8 GP™ ZGP323 USB Programming System
ZGP323ICE15ZEM	Z8 GP™ ZGP323 In-Circuit Emulator

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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Z8 GP™ ZGP323 Development Tools

In-Circuit Emulator and Low-Cost Programmer

Overview

ZiLOG's Z8 GP™ ZGP323 development tools are designed for the low cost general purpose 8-bit microcontroller (MCU) market. Choose from our high end in-circuit emulator or from one of our low cost programming systems. Whatever your development needs are; our ZGP323 development tools enable you to design your new 8-bit MCU application with ease and get to market faster. Included with our emulators and programming systems, is our ZDS II Integrated Development Environment (IDE) with a full ANSI C Compiler at no additional cost.

Z8 GP™ ZGP323 In-Circuit Emulator (ICE)

In-Circuit Emulator and Target Pods

Your development team will appreciate the design flexibility and speed offered by the trace and event system included in the ZGP323 ICE. Reduce the guesswork in troubleshooting of complex applications with this high end development tool. For emulation of the ZGP323 OTP use the provided 20- or 28-pin PDIP emulation target pods. Emulation in other package types is available with a purchase of an additional package converter of your choice.

Evaluation Board

Supplied with the ZGP323 ICE kit is an evaluation board to help you jumpstart your development process. Containing a 20- and 28-pin socket, the evaluation board gives you a head start on emulation. It also provides the ability to run the sample code and get familiar with the ZGP323 ICE features and best practice examples.

OTP Programming Module and Adapters

Once your code is debugged and optimized to your specifications, use the included OTP programming module to burn your finished program onto the provided windowed ceramic DIP microcontroller. You can either burn code in your current ZDS II project or load an existing hex file. The programming module contains a 40-pin DIP ZIF socket, but 20- and 28-pin PDIP programming adapters also come included with the ZPG323 ICE. Programming adapters in other package types are available for purchase separately.

Z8 GP™ ZGP323 Programming Systems

The ZGP323 programming systems provide a complete yet inexpensive solution for development with Z8 GP™ microcontrollers. The systems include an OTP programming module with a 40-pin DIP ZIF socket and 20- and 28-pin programming adapters. The supplied windowed ceramic DIP ZGP323 microcontrollers can be reprogrammed multiple times as they are erasable under ultraviolet light. The programming systems are available in two different versions, Ethernet or USB.

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Z8 GP™ ZGP323 Programming Systems

ZGP323 Ethernet Programming System P/N: ZGP32300100ZPR	ZGP323 USB Programming System P/N: ZGP32300200ZPR
Ethernet CAT-5 crossover cable, RS-232 serial cable Z8 Programmer, debug interface module	USB interface cable
OTP Programming Module with a 40-pin DIP ZIF socket	
20- and 28-pin DIP programming adapters	
Windowed ceramic DIP 28-pin ZGP323 MCU samples	
5V DC universal power supply	
ZDS II Integrated Development Environment (IDE) and sample code	
Supporting documentation	

Adapter Kit Ordering Information

ZGP323 programming adapters in 20- or 28-pin SOIC and in 20-, 28-, or 48-pin SSOP package types are available for purchase separately. Emulation package converters are available for purchase through Ironwood. For more information, please visit our website or refer to the supporting user manuals.

ZDS II Integrated Development Environment (IDE)

The Z8 GP™ ZGP323 development tools include our industry-leading ZiLOG Developer Studio II IDE. Combining an easy-to-use Windows-based GUI with multithreading capability, ZDS II provides an environment that streamlines code development. Tools include a language-sensitive editor, project manager, assembler, linker, librarian, debugger, and a full ANSI C compiler. ZiLOG development tools give you the edge over your competition.

Supported Z8 GP™ MCU Devices

ZGP323L Z8 GP™ ZGP323 Low Voltage OTP Series (2.0-3.6V, 4KB to 32KB)
ZGP323H Z8 GP™ ZGP323 High Voltage OTP Series (2.0-5.5V, 4KB to 32KB)
ZGR163L Z8 GP™ ZGP163 Low Voltage ROM Series (2.0-3.6V, 1KB to 16KB)
ZGR323L Z8 GP™ ZGP163 Low Voltage ROM Series (2.0-3.6V, 4KB to 32KB)

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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Z8 Encore! XP® F08xA Series
Development Kit

8-Pin Development Kit

20, 28-Pin Development Kit

OVERVIEW

Evaluate. Design. Build. That's the simple power behind the value of the ZiLOG Z8 Encore! XP® F08xA Series Development Kit. Our complete development platform includes all the hardware and software you need to cut design time and get your products to market faster.

These new kits feature the Z8 Encore! XP® F08xA series MCU, with new features such as a full range temperature sensor and a transimpedance amplifier, which have their outputs processed by an enhanced sigma-delta analog to digital converter. The Z8 Encore! XP® F08xA series MCU is perfect for a wide range of consumer and industrial applications.

Use the Z8 Encore! XP® F08xA Series Development Kits both to evaluate our new MCU and create your Z8 Encore! XP® F08xA series MCU product solution. You get everything you need to go from concept to design - there's nothing else to buy. Discover the value and power ZiLOG brings to your next 8-bit MCU design. Order a Z8 Encore! XP® F08xA Series Development Kit today!

Z8 Encore! XP® F08xA Series MCU Development Kit Contents

Hardware

- Z8 Encore! XP® F08xA Series Development Board
- Serial or USB Smart Cable
- 5V DC Universal Power Supply

Software

- ZDS II Integrated Development Environment (IDE)
- ANSI C-Compiler
- Sample Code

Documentation/CD-ROM

- Development Kit Quick Start Guide
- Development Kit User Manual
- ZDS II - IDE User Manual
- eZ8 CPU User Manual
- Product Specifications
- Product Briefs
- Application Notes

Development Board Features

- Z8 Encore! XP® F08xA MCU
- Three LEDs
- RS-232 interface
- IrDA transceiver
- Two Push Buttons, RESET and TEST
- 5V DC power connector
- On-chip debugger interface
- Header for ADC input (not present on 8-pin board)
- Prototyping area
- External interface connectors
- 2.7-3.6V operating range with 5V tolerant inputs

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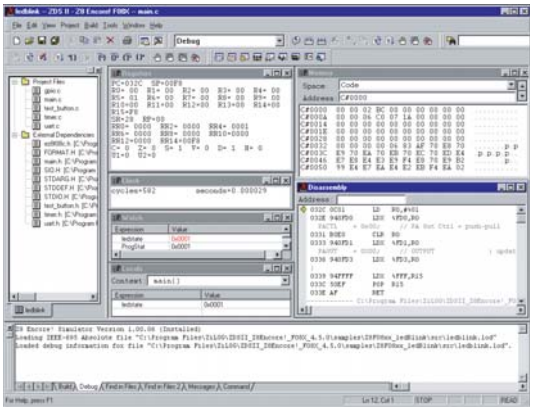
Z8 Encore! XP® F08xA Series Development Kit



Z8 Encore!® MCU ZDS II - IDE GUI

ZiLOG Developer Studio II Integrated Development Environment is a complete suite of software tools that supports development with the Z8 Encore! XP® MCUs. Its easy-to-use Windows-based GUI provides an environment that accelerates the edit, compile, and debug cycle. Included in ZDS II are a language sensitive editor, project manager, compiler, assembler, linker, librarian, and debugger.

C Compiler

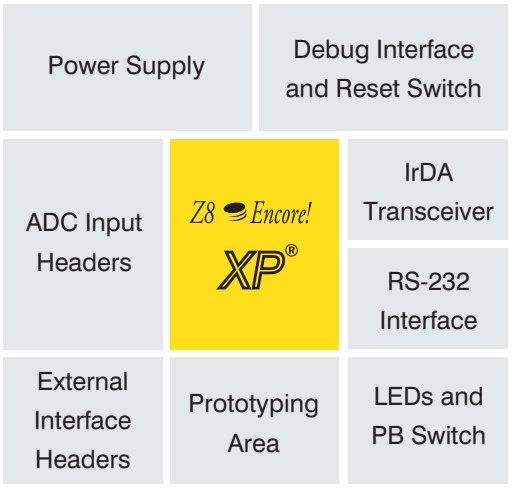
A full version ANSI C compiler is included in this kit at no additional cost allowing you to begin your design immediately. The C compiler supports a powerful configurable optimizer allowing code to be optimized for speed or size.

Smart Cable

This small circuit board provides reliable and robust communication between your desktop PC and the development board. Use it for your development board and again with your final product's hardware.

Serial Smart Cable converts RS-232 signals to communicate with the on-chip debugger of the eZ8 core.
P/N: Z8ENCORE000ZAC

USB Smart Cable is compatible with both USB high-speed and full-speed standards and converts the signals sent from the USB port on your development PC to communicate with the on-chip debugger.
P/N: ZUSBSC00100ZAC



Device	MEMORY Flash (Bytes)	MEMORY SRAM (Bytes)	Speed (MHz)	I/O Lines	16-Bit Timers	10-Bit A/D Channels	UART	Comparator	Other Features	Operating Voltage	Temp. Range (°C)	Pin Count	Development Kit
Z8F081A	8K	1K	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	8 28,20	Z8F04A08100KIT Z8F08A28100KIT
Z8F082A	8K	1K	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	8 28,20	Z8F04A08100KIT Z8F08A28100KIT

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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Z8 Encore! XP®

4K Series Development Kit

8-Pin Development Kit

20, 28-Pin Development Kit

OVERVIEW

Evaluate. Design. Build. That's the simple power behind the value of the ZiLOG Z8 Encore! XP® 4K Series Development Kit. Our complete development platform includes all the hardware and software you need to cut design time and get your products to market faster.

These new kits feature the Z8 Encore! XP® 4K Series Flash MCU, with new features such as a full range temperature sensor and a transimpedance amplifier which have their outputs processed by an enhanced sigma-delta analog to digital converter. The Z8 Encore! XP® 4K Series Flash MCU is perfect for applications such as motor control, security systems, systems monitoring, personal electronic devices, home appliances, home automation, and sensor monitoring.

Use the Z8 Encore! XP® 4K Series Development Kits both to evaluate our new MCU and create your Z8 Encore! XP® 4K Series MCU product solution. You get everything you need to go from concept to design - there's nothing else to buy. Discover the value and power ZiLOG brings to your next 8-bit MCU design. Order a Z8 Encore! XP® 4K Series Development Kit today!

Z8 Encore! XP® 4K Series MCU Development Kit Contents

Hardware

- Z8 Encore! XP® 4K Series Development Board
- Serial or USB Smart Cable
- 5V DC Universal Power Supply

Software

- ZDS II Integrated Development Environment (IDE)
- ANSI C-Compiler
- Sample Code

Documentation/CD-ROM

- Development Kit Quick Start Guide
- Development Kit User Manual
- ZDS II - IDE User Manual
- eZ8 CPU User Manual
- Product Specifications
- Product Briefs
- Application Notes

Development Board Features

- Z8 Encore! XP® 4K MCU
- Three LEDs
- RS-232 interface
- IrDA transceiver
- Two Push Buttons, RESET and TEST
- 5V DC power connector
- On-chip debugger interface
- Header for ADC input (not present on 8-pin board)
- Prototyping area
- External interface connectors
- 2.7-3.6V operating range with 5V tolerant inputs

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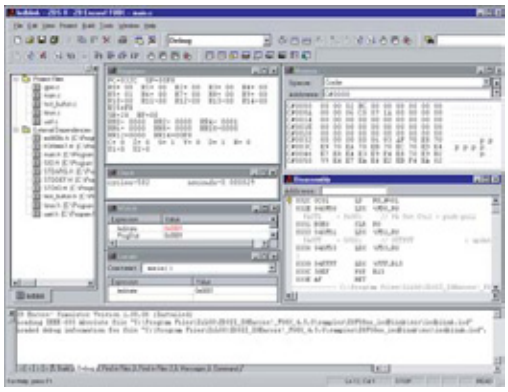
Z8 Encore! XP® 4K Series Development Kit



Z8 Encore!® MCU ZDS II IDE GUI

ZiLOG Developer Studio II Integrated Development Environment is a complete suite of software tools that supports development with the Z8 Encore!® MCU. Its easy-to-use Windows-based GUI provides an environment that accelerates the edit, compile, and debug cycle. Included in ZDS II are a language sensitive editor, project manager, compiler, assembler, linker, librarian, and debugger.

C Compiler

A full version ANSI C compiler is included in this kit at no additional cost allowing you to begin your design immediately. The C compiler supports a powerful configurable optimizer allowing code to be optimized for speed or size.

Smart Cable

This small circuit board provides reliable and robust communication between your desktop PC and the development board. Use it for your development board and again with your final product's hardware.

Serial Smart Cable converts RS-232 signals to communicate with the on-chip debugger of the eZ8 core.
P/N: Z8ENCORE000ZAC

USB Smart Cable is compatible with both USB high-speed and full-speed standards and converts the signals sent from the USB port on your development PC to communicate with the on-chip debugger.
P/N: ZUSBSC00100ZAC

Device	MEMORY			Speed (MHz)	I/O Lines	16-Bit Timers	10-bit A/D Channels	UART	Comparator	Other Features	Operating Voltage	Temp. Range (°C)	Pin Count	Development Kit
	Flash (Bytes)	NVDS (Bytes)	SRAM (Bytes)											
Z8F042A	4K	128	1K	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F041A	4K	128	1K	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F022A	2K	64	512	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F021A	2K	64	512	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F012A	1K	16	256	20	23	2	8	1	1	Temp. Sensor, Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT
Z8F011A	1K	16	256	20	25	2	-	1	1	Int. Prec. Oscillator	2.7-3.6V	-40° to 105°	28,20 8	Z8F04A28100KIT Z8F04A08100KIT

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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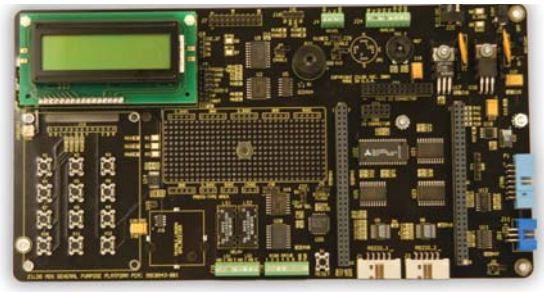
ZiLOG's General-Purpose MDS Application Board



OVERVIEW

- Supports the eZ80Acclaim!™ eZ80F91, Z8 Encore!® 8K and 64K Series, and Z8 Encore! XP™ 4K Series microcontrollers
- Footprints for RF, GPS, and Digital Compass
- The perfect foundation for your innovative application development ideas

ZiLOG's General-Purpose Modular Development System (MDS) Application Board gives you the peripherals you need to design your innovative applications using any ZiLOG MDS-compatible development board. Our MDS application board provides several PCB footprints and connectors that enable you to add functions as needed in your designs.

Built-in terminal blocks for many I/O connections are included, providing easy access to your external hardware. The MDS application board provides a number of RS232 options that are selectable by software control or jumper settings. The kit includes an MDS general-purpose application board, CD-ROM, and supporting documentation. ZiLOG's MDS development boards are sold as stand-alone development kits to work along with existing eZ80Acclaim!™, Z8 Encore!®, and Z8 Encore! XP® development tools. The MDS general purpose board speeds your time-to-market by providing you with the most frequently used features needed for 8-bit MCU application development.

FEATURES

- Supports the eZ80Acclaim!™ eZ80F91, Z8 Encore!® 8K and 64K Series, and Z8 Encore! XP® 4K Series microcontrollers
- 2 x 16 character LCD display
- 3 x 4 keypad matrix
- 512KB fast SRAM
- Both 5 and 9-12 VDC input jacks
- RS485 interface/screw terminal block I/O: +12VDC, D+, D-, GND (board power can be provided using this 12VDC input)
- Terminal block inputs for some ADC channels on the Z8 Encore! MCU family
- Six high-drive outputs with terminal blocks. Jumper-selectable 5 or 12VDC supply
- Two relays with terminal block
- Plug-in for Trimble Lasson SQ GPS module (GPS module not included)
- Plug-in for Maxstream (900MHz or 2.4 GHz) data module (RF module not included)
- Buzzer
- I^2C temperature sensor
- I^2C 4-pin I/O connector
- External 8 bit data I/O connector. Can interface to large graphic LCD displays
- Large bread board area
- Two 10-pin RS232 ports
- Pot control for one ADC channel
- Footprint for Dinsmore 1490 Digital Compass
- Software- or jumper-controllable RS232 routing
- Footprints for additional Flash memory devices
- 4-layer PCB
- Battery option
- JTAG and Zilog's ZDI debug interface
- Measures 5 ¼ inches by 9 ¾ inches

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ZiLOG's General-Purpose MDS Application Board

<table>
<tr><td>External Memory</td><td>External 8-Bit Bus</td><td>2 x 16 LCD Display</td></tr>
<tr><td>Two RS-232 4-wire</td><td rowspan="3">MDS-Compatible Development Board</td><td>3 x 4 Keypad</td></tr>
<tr><td rowspan="2">Optional GPS, RF Transceiver, Digital Compass</td><td>ADC Terminal Block Inputs</td></tr>
<tr><td>I^2C Bus Expanders</td><td>Buzzer</td></tr>
<tr><td colspan="2">Relays, Temp Sensor, High-Drive Outputs</td><td>Power Supply</td></tr>
</table>

Application Ideas

- Internet 'Enabled' peripherals with eZ80F91 module
- RS485 master or slave mode system
- IrDA to RS232 or RS485/RF bridge
- Mini-computer with RF link
- Send GPS data to RS232, RS485, IrDA or RF
- Drive high current lamps, LEDS, motors
- Agriculture feed monitoring
- Weather station
- Robotics control
- Remote monitoring

Ordering Information

ZGENPRP0100MDS	ZiLOG General-Purpose MDS Application Board

Supported Development Kits

EZ80F910200ZCO	eZ80F91 Development Kit
Z8F64200100KIT	Z8 Encore!® 64K Series Development Kit
Z8F08200100KIT	Z8 Encore!® 8K Series Development Kit
Z8F04A28100KIT	Z8 Encore! XP® 4K Series Development Kit
Z8F04A08100KIT	Z8 Encore! XP® 4K Series 8-Pin Development Kit

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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ZiLOG

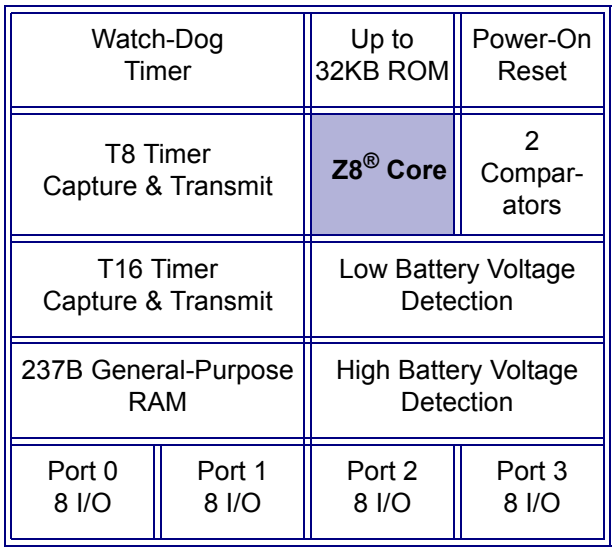
Z8 GP™ Microcontrollers

ZGR323L ROM MCU Family

Product Brief

PB015303-0605

Product Block Diagram



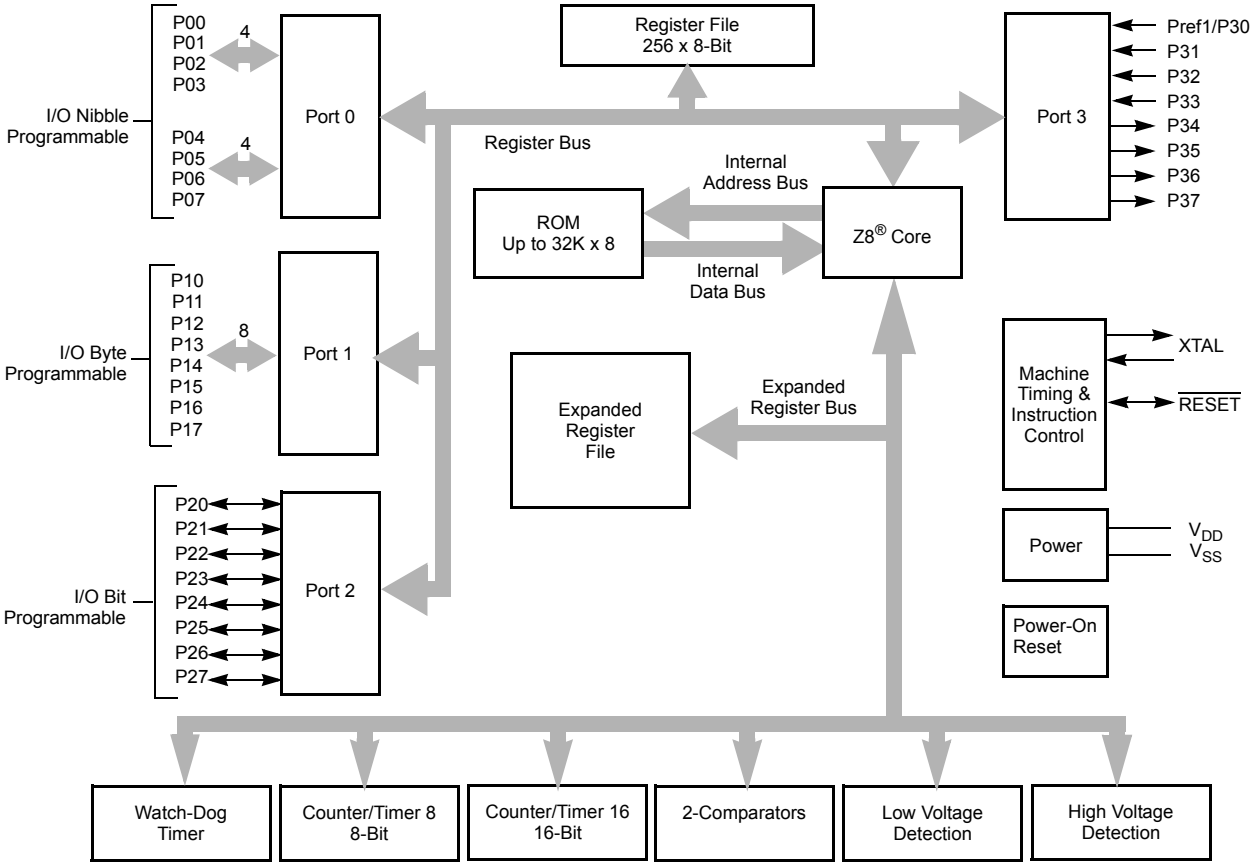
Features

- 2.0 to 3.6V operation
- Low power consumption–6mW (typical)
- Three standby modes:
  - STOP—2µA (typical)
  - HALT—0.8mA (typical)
  - Low voltage reset
- Special architecture to automate both generation and reception of complex pulses or signals:
  - One programmable 8-bit counter/timer with two capture registers and two load registers
  - One programmable 16-bit counter/timer with one capture register and two reload registers
  - Programmable input glitch filter for pulse reception
- Six priority interrupts
  - Three external
  - Two assigned to counter/timers
  - One low-voltage detection interrupt
- Low voltage detection and high voltage detection flags
- Programmable Watch-Dog Timer (WDT)
- Power-On Reset (POR) circuits
- Two independent comparators with programmable interrupt polarity
- Programmable ROM options
  - Port 0: 0–3 pull-up transistors
  - Port 0: 4–7 pull-up transistors
  - Port 1: 0–3 pull-up transistors
  - Port 1: 4–7 pull-up transistors
  - Port 2: 0–7 pull-up transistors
  - Port 3: 0–3 pull-ups
  - WDT enabled at POR
- Standard (0° to +70°C), Extended (-40° to +105°C) and Automotive (-40° to +125°C) temperature ranges

General Description

The ZGR323L is an ROM-based member of the ZiLOG® MCU family of general purpose microcontrollers. With 237 bytes of general-purpose RAM and up to 32KB of ROM, ZiLOG's CMOS microcontrollers offer fast-executing use of memory, sophisticated interrupts, input/output bit manipulation, automated pulse generation/reception, and internal key-scan pull-up transistors. Compatible with ZGR163L/ZGP323L families.

Block Diagram



Note: Refer to the specific package for available pins.

Figure 1. Functional Block Diagram

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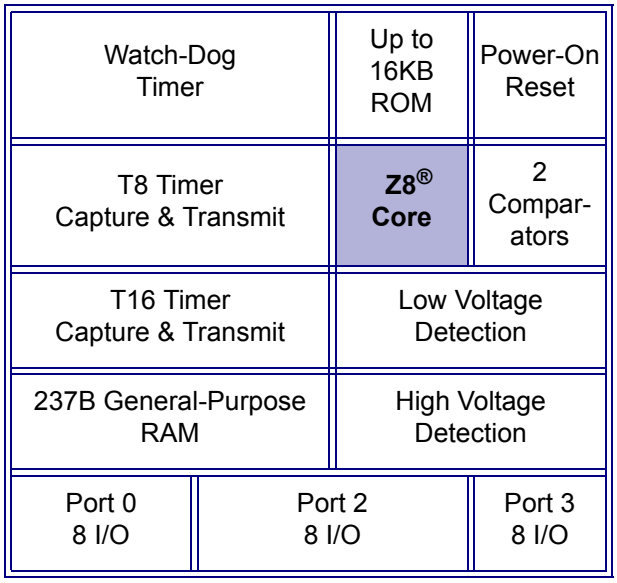
Z8 GP™ Microcontrollers

ZGR163L ROM MCU Family

Product Brief

PB015203-0605

Product Block Diagram



Features

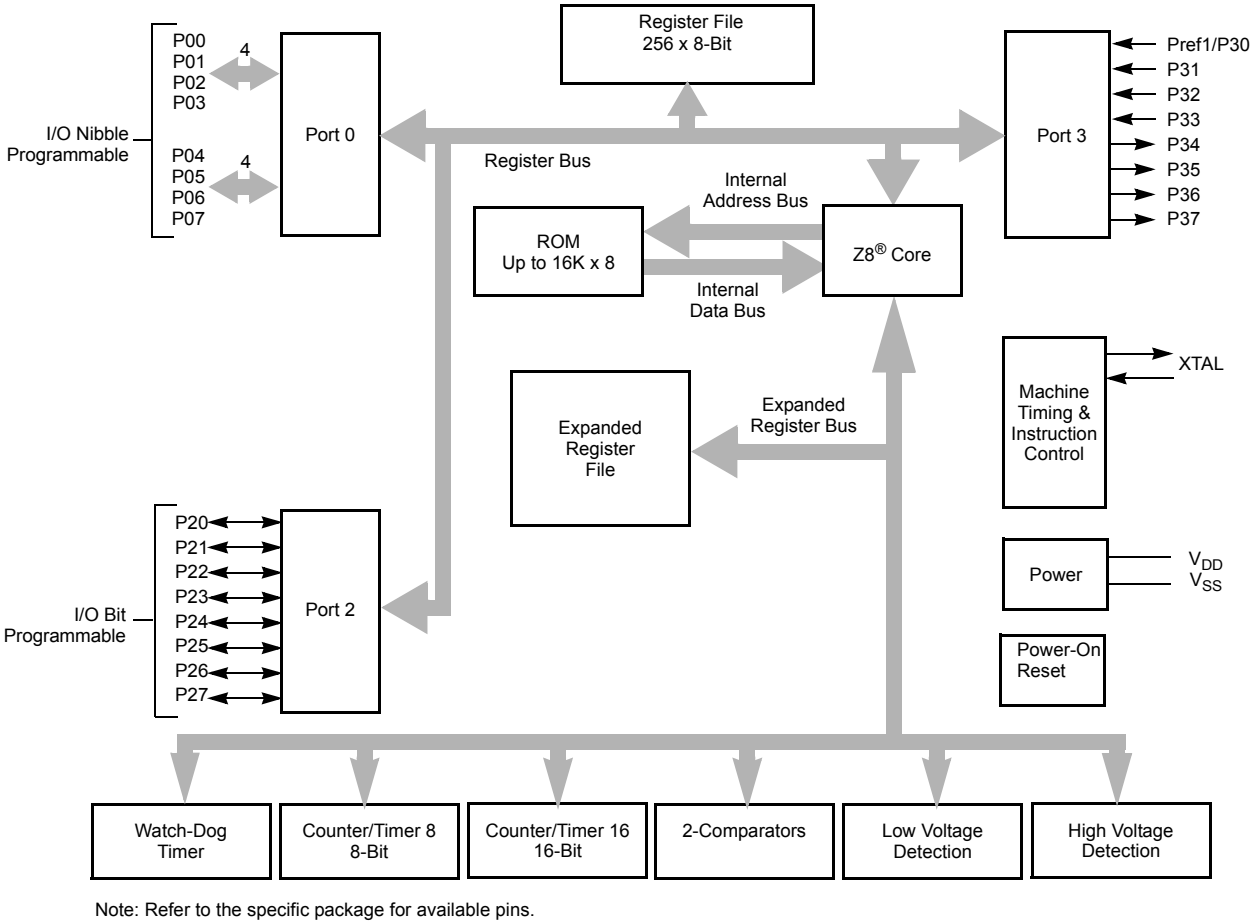
- 2.0 to 3.6V operation
- Low power consumption–6mW (typical)
- Three standby modes:
  - STOP—2µA (typical)
  - HALT—0.8mA (typical)
  - Low voltage reset
- Special architecture to automate both generation and reception of complex pulses or signals:
  - One programmable 8-bit counter/timer with two capture registers and two load registers
  - One programmable 16-bit counter/timer with one capture register and two reload registers
  - Programmable input glitch filter for pulse reception
- Six priority interrupts
  - Three external
  - Two assigned to counter/timers
  - One low-voltage detection interrupt
- Low voltage detection and high voltage detection flags
- Programmable Watch-Dog Timer (WDT)
- Power-On Reset (POR) circuits
- Two independent comparators with programmable interrupt polarity
- Programmable ROM options
  - Port 0: 0–3 pull-up transistors
  - Port 0: 4–7 pull-up transistors
  - Port 2: 0–7 pull-up transistors
  - Port 3: 0–3 pull-ups
  - WDT enabled at POR
- Standard (0° to +70°C), Extended (-40° to +105°C) and Automotive (-40° to +125°C) temperature ranges

General Description

The ZGR163L is an ROM-based member of the ZiLOG® MCU family of general purpose microcontrollers. This family has 237 bytes of general-purpose RAM. ZiLOG's general purpose microcontrollers offer fast-executing efficient use of memory, sophisticated interrupts, input/output bit manipulation capabilities, automated pulse generation/reception, and internal key-scan pull-up transistors.

This family of devices is compatible with the ZGR323L ROM mask and ZGP323L OTP families.

Block Diagram



Note: Refer to the specific package for available pins.

Figure 1. Functional Block Diagram

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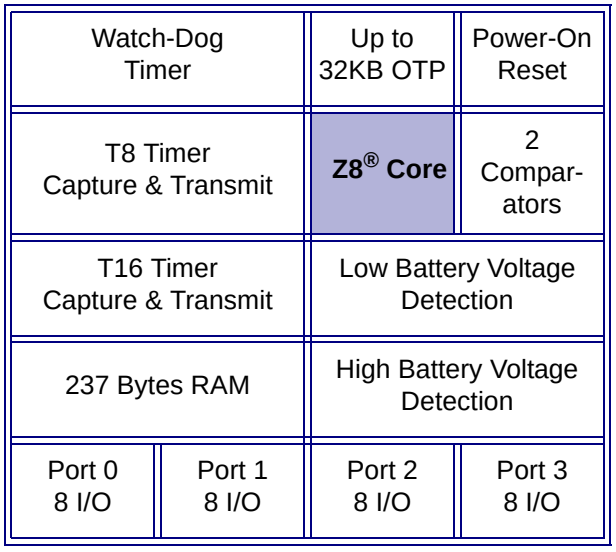
Z8 GP™ OTP Microcontrollers

ZGP323L OTP MCU Family

Product Brief

PB015102-0305

Product Block Diagram



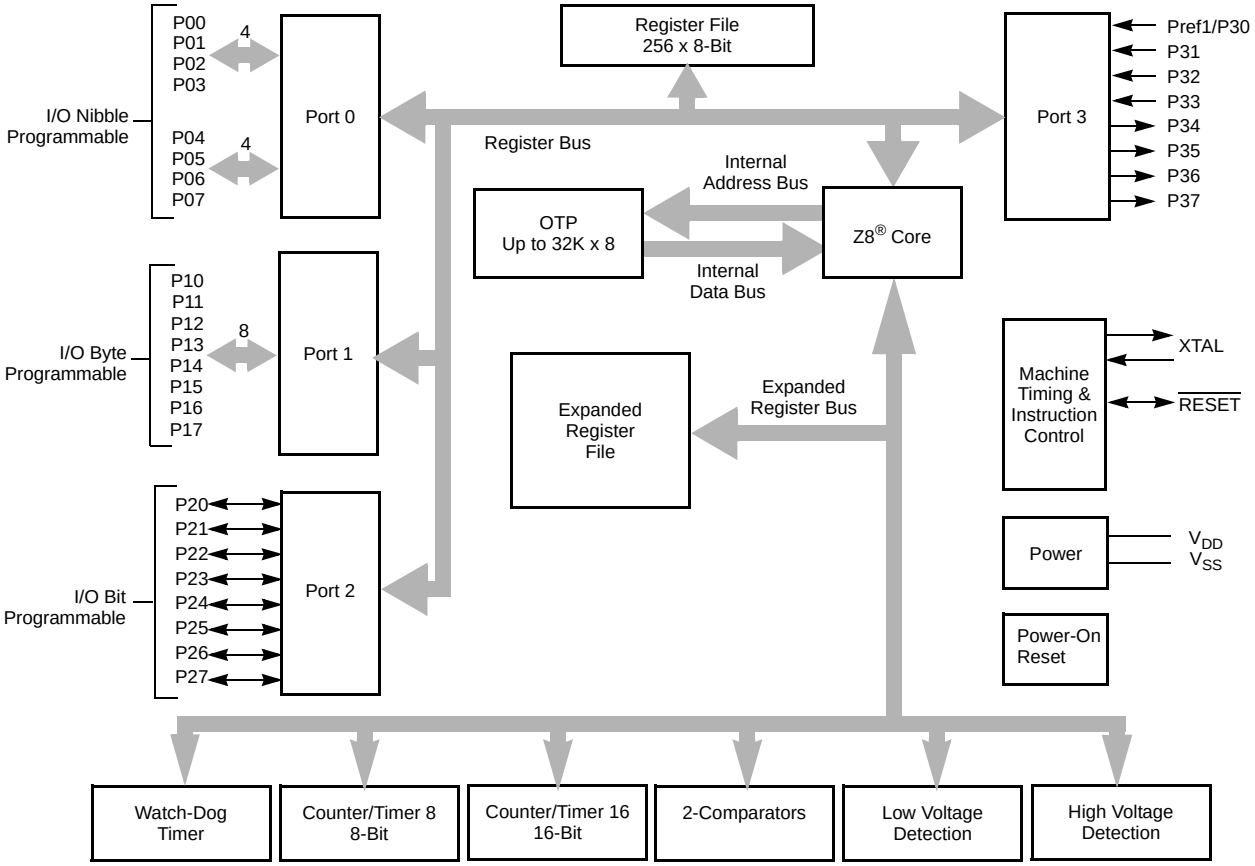
Features

- 2.0 to 3.6V operation
- Low power consumption–6mW (typical)
- Three standby modes:
  - STOP—2µA (typical)
  - HALT—0.8mA (typical)
  - Low voltage reset
- Special architecture to automate both generation and reception of complex pulses or signals:
  - One programmable 8-bit counter/timer with two capture registers and two load registers
  - One programmable 16-bit counter/timer with one capture register and two reload registers
  - Programmable input glitch filter for pulse reception
- Six priority interrupts
  - Three external
  - Two assigned to counter/timers
  - One low-voltage detection interrupt
- Low voltage detection and high voltage detection flags
- Programmable Watch-Dog Timer (WDT)
- Power-On Reset (POR) circuits
- Two independent comparators with programmable interrupt polarity
- Programmable EPROM options
  - Port 0: 0–3 pull-up transistors
  - Port 0: 4–7 pull-up transistors
  - Port 1: 0–3 pull-up transistors
  - Port 1: 4–7 pull-up transistors
  - Port 2: 0–7 pull-up transistors
  - EPROM Protection
  - WDT enabled at POR
- Standard (0° to +70°C), Extended (-40° to +105°C) and Automotive (-40° to +125°C) temperature ranges

General Description

The ZGP323L is an OTP-based member of the ZiLOG® MCU family of general purpose microcontrollers. With 237 bytes of general-purpose RAM and up to 32KB of OTP, ZiLOG's CMOS microcontrollers offer fast-executing use of memory, sophisticated interrupts, input/output bit manipulation, automated pulse generation/reception, and internal key-scan pull-up transistors. Compatible with ZGR163L/ZGR323L families.

Block Diagram



Note: Refer to the specific package for available pins.

Figure 1. Functional Block Diagram

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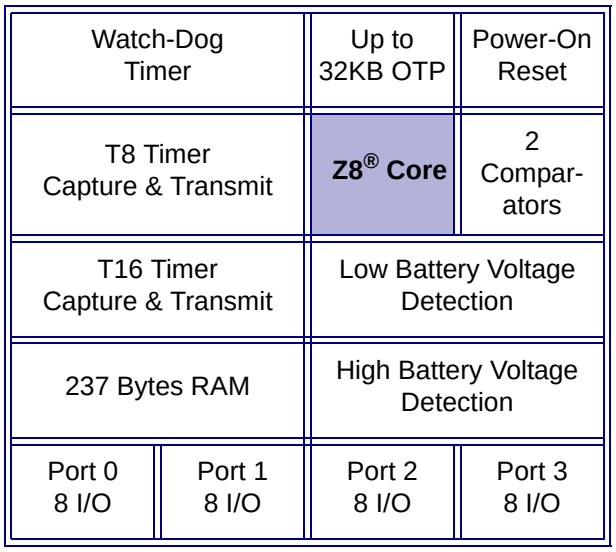
Z8 GP™ OTP Microcontrollers

ZGP323H OTP MCU Family

Product Brief

PB015003-0305

Product Block Diagram



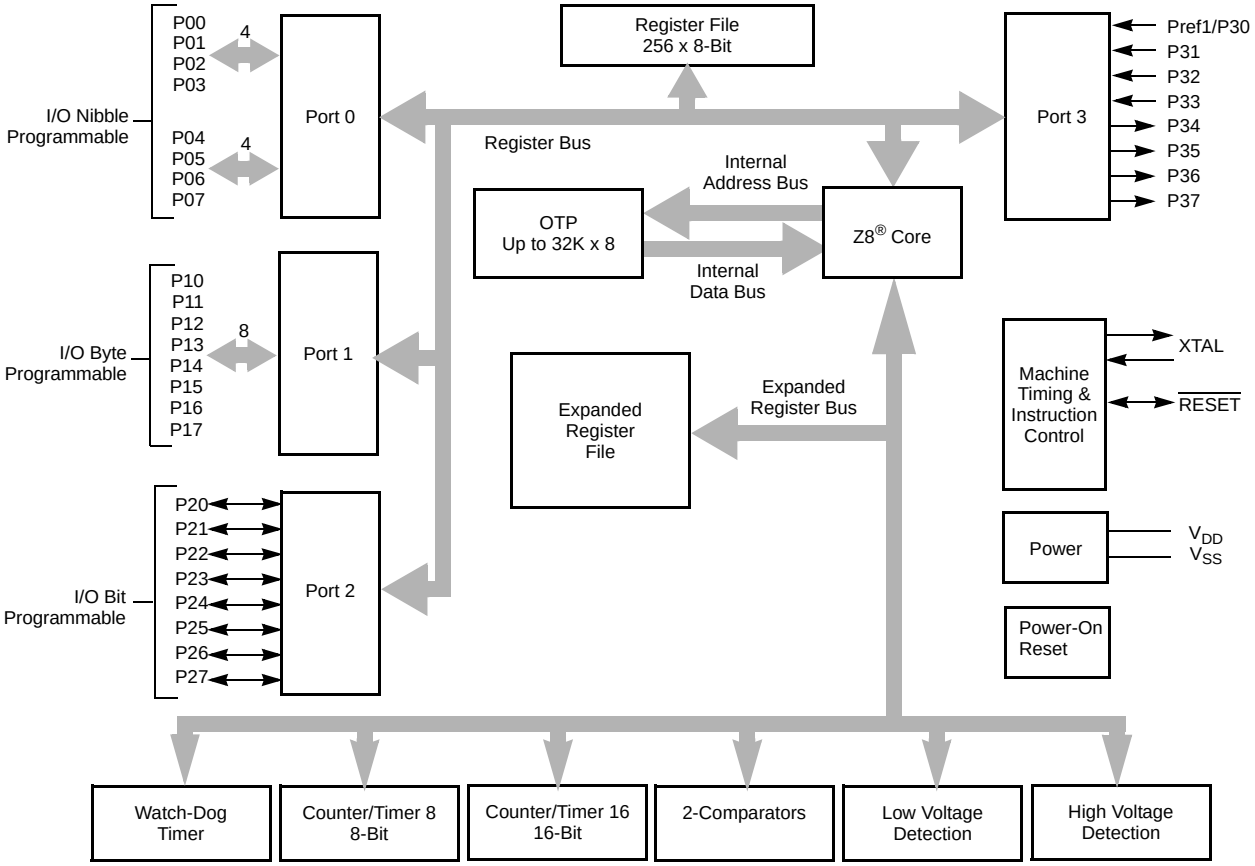
Features

- 2.0 to 5.5V operation
- Low power consumption–6mW (typical)
- Three standby modes:
  - STOP—2µA (typical)
  - HALT—0.8mA (typical)
  - Low voltage reset
- Special architecture to automate both generation and reception of complex pulses or signals:
  - One programmable 8-bit counter/timer with two capture registers and two load registers
  - One programmable 16-bit counter/timer with one capture register and two reload registers
  - Programmable input glitch filter for pulse reception
- Six priority interrupts
  - Three external
  - Two assigned to counter/timers
  - One low-voltage detection interrupt
- Low voltage detection and high voltage detection flags
- Programmable Watch-Dog Timer (WDT)
- Power-On Reset (POR) circuits
- Two independent comparators with programmable interrupt polarity
- Programmable EPROM options
  - Port 0: 0–3 pull-up transistors
  - Port 0: 4–7 pull-up transistors
  - Port 1: 0–3 pull-up transistors
  - Port 1: 4–7 pull-up transistors
  - Port 2: 0–7 pull-up transistors
  - EPROM Protection
  - WDT enabled at POR
- Standard (0° to +70°C), Extended (-40° to +105°C) and Automotive (-40° to +125°C) temperature ranges

General Description

The ZGP323H is an OTP-based member of the ZiLOG® MCU family of general purpose microcontrollers. With 237 bytes of general-purpose RAM and up to 32KB of OTP, ZiLOG's CMOS microcontrollers offer fast-executing use of memory, sophisticated interrupts, input/output bit manipulation, automated pulse generation/reception, and internal key-scan pull-up transistors. Compatible with ZGR163L/ZGR323L families.

Block Diagram



Note: Refer to the specific package for available pins.

Figure 1. Functional Block Diagram

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Z8 GP™ ZGP323 Development Tools

In-Circuit Emulator and Low-Cost Programmer

Overview

ZiLOG's Z8 GP™ ZGP323 development tools are designed for the low cost general purpose 8-bit microcontroller (MCU) market. Choose from our high end in-circuit emulator or from one of our low cost programming systems. Whatever your development needs are; our ZGP323 development tools enable you to design your new 8-bit MCU application with ease and get to market faster. Included with our emulators and programming systems, is our ZDS II Integrated Development Environment (IDE) with a full ANSI C Compiler at no additional cost.

Z8 GP™ ZGP323 In-Circuit Emulator (ICE)

In-Circuit Emulator and Target Pods

Your development team will appreciate the design flexibility and speed offered by the trace and event system included in the ZGP323 ICE. Reduce the guesswork in troubleshooting of complex applications with this high end development tool. For emulation of the ZGP323 OTP use the provided 20- or 28-pin PDIP emulation target pods. Emulation in other package types is available with a purchase of an additional package converter of your choice.

Evaluation Board

Supplied with the ZGP323 ICE kit is an evaluation board to help you jumpstart your development process. Containing a 20- and 28-pin socket, the evaluation board gives you a head start on emulation. It also provides the ability to run the sample code and get familiar with the ZGP323 ICE features and best practice examples.

OTP Programming Module and Adapters

Once your code is debugged and optimized to your specifications, use the included OTP programming module to burn your finished program onto the provided windowed ceramic DIP microcontroller. You can either burn code in your current ZDS II project or load an existing hex file. The programming module contains a 40-pin DIP ZIF socket, but 20- and 28-pin PDIP programming adapters also come included with the ZPG323 ICE. Programming adapters in other package types are available for purchase separately.

Z8 GP™ ZGP323 Programming Systems

The ZGP323 programming systems provide a complete yet inexpensive solution for development with Z8 GP™ microcontrollers. The systems include an OTP programming module with a 40-pin DIP ZIF socket and 20- and 28-pin programming adapters. The supplied windowed ceramic DIP ZGP323 microcontrollers can be reprogrammed multiple times as they are erasable under ultraviolet light. The programming systems are available in two different versions, Ethernet or USB.

ZiLOG

Z8 GP™ ZGP323 Programming Systems

ZGP323 Ethernet Programming System P/N: ZGP32300100ZPR	ZGP323 USB Programming System P/N: ZGP32300200ZPR
Ethernet CAT-5 crossover cable, RS-232 serial cable Z8 Programmer, debug interface module	USB interface cable
OTP Programming Module with a 40-pin DIP ZIF socket	
20- and 28-pin DIP programming adapters	
Windowed ceramic DIP 28-pin ZGP323 MCU samples	
5V DC universal power supply	
ZDS II Integrated Development Environment (IDE) and sample code	
Supporting documentation	

Adapter Kit Ordering Information

ZGP323 programming adapters in 20- or 28-pin SOIC and in 20-, 28-, or 48-pin SSOP package types are available for purchase separately. Emulation package converters are available for purchase through Ironwood. For more information, please visit our website or refer to the supporting user manuals.

ZDS II Integrated Development Environment (IDE)

The Z8 GP™ ZGP323 development tools include our industry-leading ZiLOG Developer Studio II IDE. Combining an easy-to-use Windows-based GUI with multithreading capability, ZDS II provides an environment that streamlines code development. Tools include a language-sensitive editor, project manager, assembler, linker, librarian, debugger, and a full ANSI C compiler. ZiLOG development tools give you the edge over your competition.

Supported Z8 GP™ MCU Devices

ZGP323L Z8 GP™ ZGP323 Low Voltage OTP Series (2.0-3.6V, 4KB to 32KB)
ZGP323H Z8 GP™ ZGP323 High Voltage OTP Series (2.0-5.5V, 4KB to 32KB)
ZGR163L Z8 GP™ ZGP163 Low Voltage ROM Series (2.0-3.6V, 1KB to 16KB)
ZGR323L Z8 GP™ ZGP163 Low Voltage ROM Series (2.0-3.6V, 4KB to 32KB)

Order your ZiLOG Development Kits at http://www.zilog.com to get your applications to market in record time.

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Z8 GP ZGP323 evaluation board

Introduction

The Z8 GP ZGP323 evaluation board is an evaluation and prototyping board for the Z8 GP family of microcontrollers. The board provides customers with a tool to evaluate features of the Z8 GP MCU.

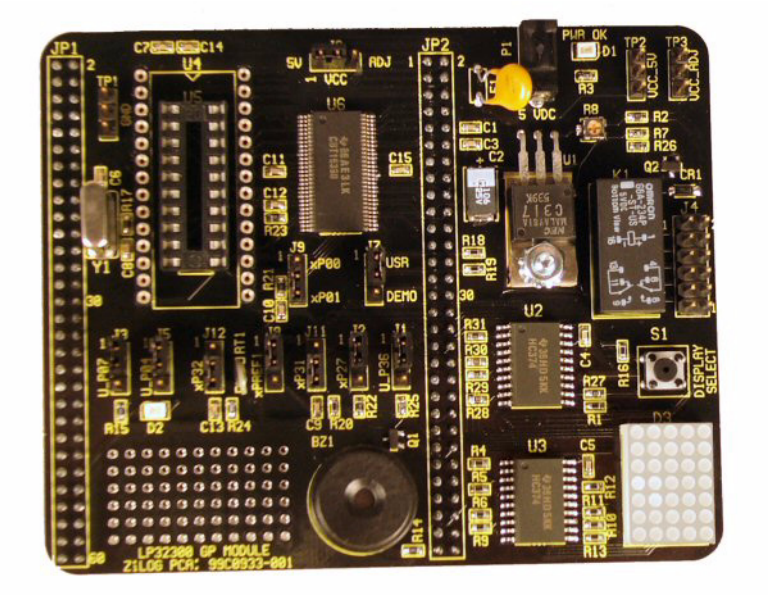

Figure 1. Z8 GP ZGP323 Evaluation Board

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Application Note

Battery-Level Detection in Z8 GP MCU Peripherals

AN020201-0904

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Abstract

This Application Note discusses the enhanced peripherals of the ZGP323 and ZGR323 devices, which are useful for battery-operated applications such as universal remote controls. This document focuses on low and high battery voltage detection offered by the synchronized T8 and T16 timers.

Z8 GP Application Board Overview

ZiLOG's ZGP323 and ZGR323 devices are one-time programmable (OTP) infrared microcontrollers. With 237 bytes of general-purpose RAM, 2.0–3.6V voltage range, high and low voltage detection, and up to 32KB of OTP, ZiLOG's CMOS microcontrollers offer fast execution, efficient use of memory, sophisticated interrupts, input/output bit-manipulation capabilities, automated pulse generation/reception, and internal key-scan pull-up transistors.

- Up to 32KB OTP
- Low power consumption—6mW (typical)
- 2.0–3.6V operating voltage
- Three standby modes:
  - STOP—2 µA (typical)
  - HALT—0.8 mA (typical)
- Low voltage
- Intelligent counter/timer architecture:
  - One programmable 8-bit counter/timer with two capture registers and two load registers
  - One programmable 16-bit counter/timer with one 16-bit register pair and one 16-bit load register pair
- Programmable input glitch filter for pulse reception
- Six priority interrupts:
  - Three external interrupts
  - Two interrupts assigned to counter/timers
  - One low-voltage detection interrupt
- Low battery voltage detection
- High battery voltage detection
- Programmable Watch-Dog Timer/Power-On Reset (WDT/POR) circuits

- Two independent comparators with programmable interrupt polarity

Figure 2 shows a block diagram of the ZGP323 and ZGR323 devices.

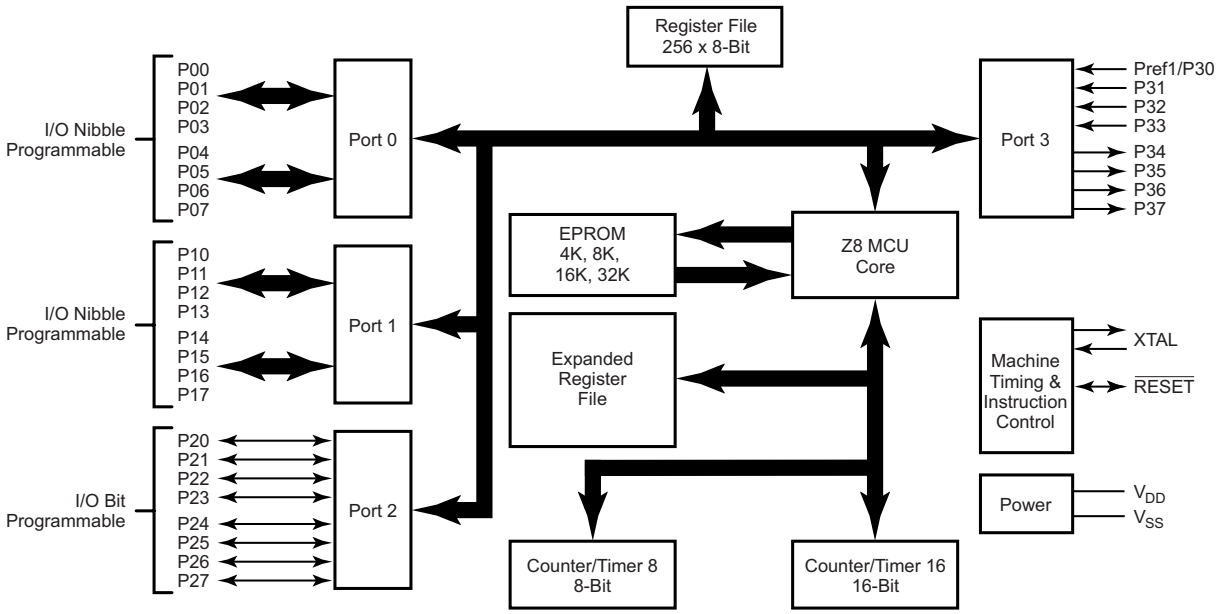


Figure 2. ZGP323 and ZGR323 Block Diagram

Discussion

In remote control applications, and in other applications in which noise is present, V_{CC} can bounce for a few hundred mV. Typically, a microcontroller's Low Voltage Detection (LVD) function cannot determine whether a battery voltage reading is truly detecting a low battery, or if the reading is actually a reflection of noise in the circuit. To address this issue, ZiLOG's Z8 GP microcontrollers offer a High Voltage Detection (HVD) function to ensure that true low battery voltage can be detected in a noisy environment.

If both HVD and LVD are set within the monitoring period, the battery can be considered to be viable, with plenty of life remaining. LVD can be triggered by noise only. However, if only LVD is set but HVD is clear for a period, the user is alerted by the low battery voltage detection function. After low voltage has been detected and the battery has been replaced with a fresh battery, HVD is triggered.

The code sample that follows details how to enable and detect high and low voltage.

```
;*************************************************************
;* Input: Vcc
;*
;* Output: P0 display the LVD register
;*************************************************************

LVD_IMAGE  .EQU  %A0            ;LVD image register
  ld rp,#%0D
  ld lvd,#1                     ;enable LVD
  nop
  nop
loop_LVD:
  ld LVD_IMAGE,lvd
  ld rp,#%0
  ld p0,LVD_IMAGE
  ld rp,#%0D
  jr loop_LVD
```

Low-Voltage Detection Register—LVD(D)0Ch

Voltage detection can be disabled by clearing bit 0 of the Low Voltage Detection Register. The default upon RESET is for low voltage detection to be disabled. See Table 1.

Table 1. Low Voltage Detection Register

Bit	7	6	5	4	3	2	1	0
Reset	1	1	1	1	1	0	0	1
CPU Access	X	X	X	X	X	R	R	R/W
*Note: X = Undefined; R/W = Read/Write; R = Read Only.								

Bit Position	Description
[7:3]	Reserved; no effect.
2	1: High voltage detection flag set.
	0: High voltage detection flag reset*.
1	1: Low voltage detection flag set.
	0: Low voltage detection flag reset*.
0	1: Enable voltage detection.
	0: Disable voltage detection.

*Note: Default after POR.

Voltage Detection and Flags

The Low Voltage Detection register (LVD, register 0Ch at the expanded register bank 0Dh) offers an option to monitor V_{CC} voltage. Voltage detection is enabled when bit 0 of LVD register is set. After voltage detection is enabled, the V_{CC} level is monitored in real time. The HVD flag (bit 2 of the LVD register) Is set only if V_{CC} is higher than V_{HVD}. The LVD flag (bit 1 of the LVD register) is set only if V_{CC} is lower than the V_{LVD}.

When voltage detection is enabled, the LVD flag also triggers an interrupt request at bit 5. IRQ5 latches the low voltage condition until it is cleared by instructions or is reset. The IRQ5 interrupt is served if it is enabled in the IMR register. Otherwise, bit 5 of the IRQ register is latched as a flag only.

Note: Voltage detection is automatically disabled in STOP mode.

Summary

ZiLOG's family of Z8 GP MCUs provides a highly-integrated but low-cost solution to infrared remote control and other general-purpose applications. It offers advanced voltage detection to monitor battery voltage in different stages. It features a maximum input/output pin and built-in Power-On Reset, Voltage Brown-Out protection. Two comparators enable the user to detect different levels (even zero) of crossing detection while running on alternate current.

The ZGP323 device offers a low-cost OTP solution to pilot runs or small volume production. It cuts down the supply chain greatly from that of mask ROM production. The user can program OTP memory at the last minute and save considerable time over typical ROM masking.

The user can employ ZiLOG's standard easy-to-use support tools, complete with a C compiler, a trace buffer, and event triggering. The Z8 GP Application Board provides full peripherals with an EEPROM, a learning remote circuit, and test points. ZiLOG's development tools enable the user to complete design work in a much shorter period.

If the user has already designed in with ZiLOG's Z86L88 family of devices, the application can be migrated to the Z8 GP family with minimum effort. ZiLOG's Z8 GP MCUs are 100% firmware- and hardware-compatible with the Z86L88 family.

This Application Note provides some checkpoints for the design conversion and is also useful as a general guide for incorporating the Z8 GP microcontroller into your design.

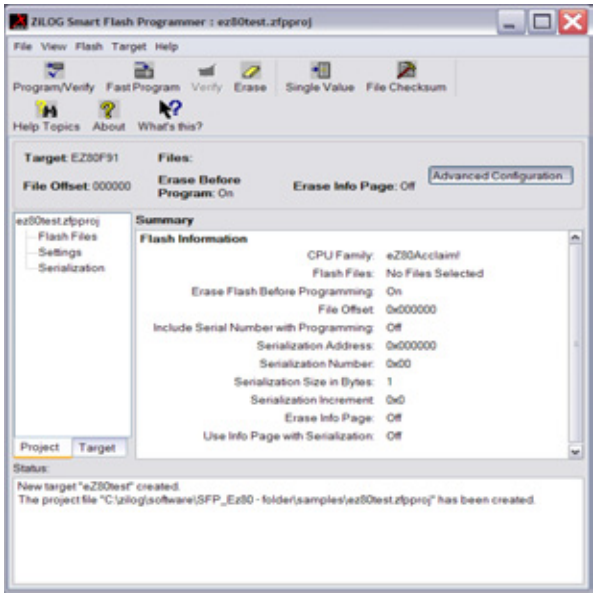
As always, ZiLOG is happy to assist you in your design efforts. Please feel free to contact the ZiLOG Technical Support Group.

Z8 Encore!® and eZ80Acclaim!™

Smart Flash Programmer

Product Brief

PB015801-1004 PRELIMINARY



Overview

ZiLOG's Smart Flash Programmer, SFP, is an in-circuit Flash MCU software programming tool that supports Z8 Encore!®, Z8 Encore! XP™, and eZ80Acclaim!™ Flash microcontroller families. The SFP is intended for low-volume production programming and field service upgrades. The ZiLOG SFP is compatible with Microsoft Windows and supports the ZiLOG serial Smart Cables, the Ethernet ZPAK, and the USB Smart Cable communication devices. The SFP is a cost-effective tool to program both ZiLOG's Flash microcontrollers and selected external Flash memory devices (eZ80Acclaim!) through the target board's ZiLOG debug interface.

Features

- MS-Windows PC-based software Flash programming tool.
- Easy-to-use GUI for production environments.
- Two end-user configurations:
  - Simplified (for use in the production environment).
  - Advanced (for detailed SFP configuration).
- Supports Program and Verify or Fast Program modes.
- Calculates hex file checksums.
- Allows you to set up serialization for programming a Flash memory location with a unique number over a range of values:
  - Supports incremental serialization.
  - Supports hex, decimal, IP, and MAC serialization values.
- Enables multiple hex file programming.
- Uses hex files produced by ZiLOG's ZDS II IDE.
- Programs attached targets through the ZiLOG debug interface. Requires use of a serial Smart Cable, USB Smart Cable or Ethernet ZPAK (eZ80Acclaim!), all available separately from ZiLOG.
- Provides programming progress indication.
- (eZ80Acclaim! version) Supports external Flash memory devices from Micron, AMD, STMicro, and Atmel.

SFP Description

In a production environment, a manufacturing engineer uses the advanced SFP configuration interface to create project files. These project files store the SFP settings for Flash memory programming on a Z8 Encore! or eZ80Acclaim! target.

Once a project is configured, factory technicians use the simplified SFP interface to automate Flash memory programming on an assembly line.

Serialization

Serialization is the ability to store customer identifier information, such as a serial number or Internet address, into Flash memory. Unique program values can be programmed into Flash, or an initial value can be set and uniformly incremented.

Supported ZiLOG Z8 Encore! and eZ80Acclaim! Communication Devices

Use of the ZiLOG Z8 Encore! SFP requires one of ZiLOG's serial or USB Smart Cables. These cables are provided in each of ZiLOG's Flash MCU development kits, and can also be purchased separately. Refer to the "Ordering Information" section for part number details.

Use of the ZiLOG eZ80Acclaim! SFP requires one of ZiLOG's serial Smart Cable, USB Smart Cable or the Ethernet ZPAK devices. These cables are provided in each of ZiLOG's Flash MPU development kits, and can also be purchased separately. Refer to the "Ordering Information" section for part number details.

The communication device connects your PC and the target board containing one of ZiLOG's Flash microcontrollers. Once you download the free SFP software onto your PC, follow the User Manual instructions and finish programming in record time.

Packaging

ZiLOG SFP software is available as a free download on the ZiLOG web site at www.zilog.com. It will also be available on the CD-ROM included with our Flash MCU development kits.

Documentation

The following available documents describe the functions and usage of the Smart Flash Programmer:

- *Z8 Encore!® Smart Flash Programmer User Manual* (UM0176)
- *eZ80Acclaim!™ Smart Flash Programmer User Manual* (UM0177)

Support Tools

The ZiLOG SFP is designed to work with hex files produced using ZiLOG's Integrated Development Environment (ZDS II) that provides code editing, assembler/C-compiler/linker features, source-level debugging and project managing facilities for quick and efficient development of embedded applications. ZDS is included with all Z8 Encore! and eZ80Acclaim! development kits.

Ordering Information

Part Number	Description
Z8FSFP00100ZPR	Z8 Encore!® Smart Flash Programmer
EZ80SFP0100ZPR	eZ80Acclaim!™ Smart Flash Programmer
Z8ENCORE000ZAC	Z8 Encore!® Serial Smart Cable Accessory Kit
EZ800000100ZAC	eZ80Acclaim!™ Serial Smart Cable Accessory Kit
ZUSBSC00100ZAC	USB Smart Cable Accessory Kit
ZDI232ZPAK2ZPK	ZPAK II Debug Interface Module

eZ80F915005MOD

eZ80F91
Mini Enet Module

Product Specification

PS023602-0804

PRELIMINARY

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The eZ80F91 Mini Enet Module

The eZ80F91 Mini Enet Module is a compact, high-performance Ethernet module specially designed for the rapid development and deployment of embedded systems requiring control and Internet/Intranet connectivity.

This expandable module is powered by ZiLOG's latest power-efficient, high-speed, optimized pipeline architecture eZ80F91 microcontroller, a member of ZILOG's family of eZ80Acclaim! Flash Microcontrollers.

The eZ80F91 is a high-speed single-cycle instruction-fetch microcontroller, which can operate with a clock speed of 50MHz. It can operate in Z80-compatible addressing mode (64KB) or full 24-bit addressing mode (16MB).

The rich peripheral set of the eZ80F91 Mini Enet Module makes it suitable for a variety of applications, including industrial control, IrDA connectivity, communication, security, automation, point-of-sale terminals, and embedded networking applications.

Module Features

- Factory-default 5MHz crystal oscillator input, 50MHz maximum operating speed via PLL
- 10/100 Base-T Ethernet PHY with RJ45 connector
- 128KB fast external SRAM
- 256KB on-chip Flash memory
- 8KB on-chip SRAM
- Real-Time Clock support
- I/O connector provides 32 general-purpose 5V-tolerant I/O pinouts
- Onboard connector provides I/O bus for external peripheral connections (IRQ, CS, 24 address, 8 data)
- Connection to eZ80Acclaim!™ Development Platform via two 56-pin mini-headers
- Small footprint 50mm x 47.5mm
- 3.3V power supply
- Standard operating temperature range: 0ºC to +70ºC

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eZ80F91 Controller Features

- The eZ80F91 device contains 256KB of Flash memory and 8KB of SRAM
- Single-cycle instruction fetch, high-performance, pipelined eZ80® CPU core
- 10/100 Mbps Ethernet MAC with 8KB frame buffer
- Low power features including SLEEP mode, HALT mode, and selective peripheral power-down control
- Two UARTs with independent baud rate generators and support for 9-bit operation
- SPI with independent clock generator
- I^2C with independent clock generator
- Infrared Data Association (IrDA)-compliant infrared encoder/decoder
- DMA-like eZ80® instructions for efficient block data transfer
- External interface with 4 chip selects, individual wait state generators, and an external WAIT input pin — supports Intel- and Motorola-style buses
- Flexible-priority vectored interrupts (both internal and external) and interrupt controller
- Real-time clock with on-chip 32KHz oscillator, selectable 50/60Hz input, and separate V_{DD} pin for battery backup
- Four 16-bit Counter/Timers with prescalers and direct input/output drive
- Watch-Dog Timer
- 32 bits of general-purpose I/O
- JTAG and ZDI debug interfaces
- 144-pin BGA package
- 3.0–3.6V supply voltage with 5V tolerant inputs
- Standard operating temperature range: 0ºC to +70ºC

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Block Diagram

Figure 1 provides a block diagram of the eZ80F91 Mini Enet Module.

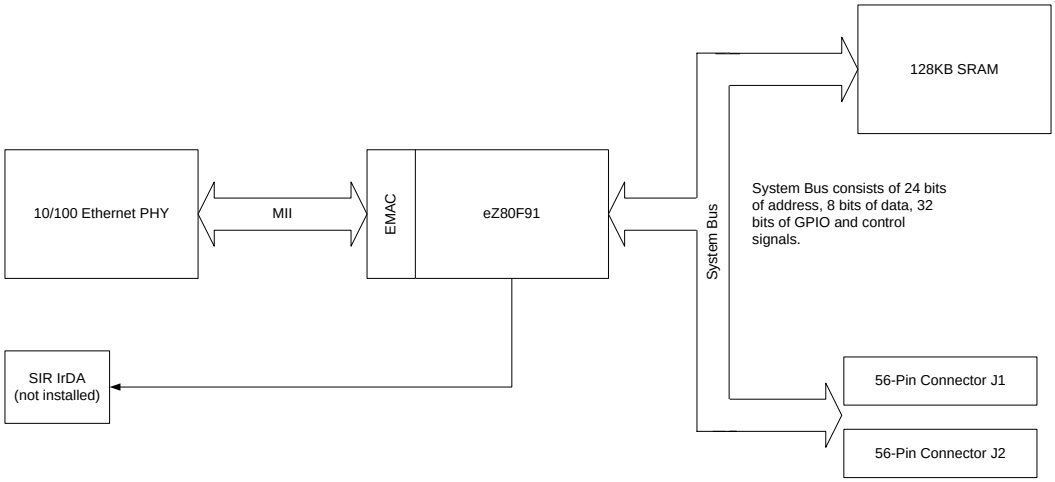

Figure 1. eZ80F91 Mini Enet Module Functional Block Diagram

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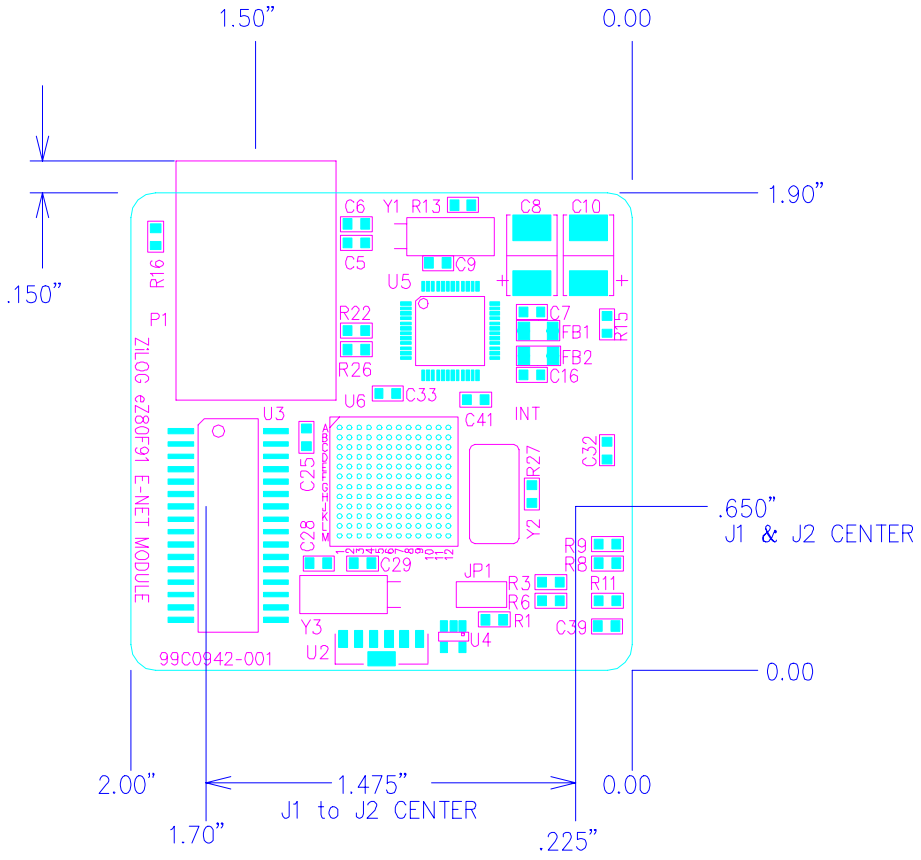

Figure 4. Physical Dimensions of the eZ80F91 Mini Enet Module

Absolute Maximum Ratings

Stresses greater than those listed in Table 4 can cause permanent damage to the device. These ratings are stress ratings only. Operation of the device at any condition outside those indicated in the operational sections of these specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For improved reliability, unused inputs should be tied to one of the supply voltages (V_{DD} or V_{SS}).

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eZ80™ Acclaim! Flash Microcontrollers Development Kit

The eZ80F91 and eZ80F92 Development Kits best exemplify the versatility and high performance of the eZ80Acclaim!™ family of Flash microcontrollers (MCUs). The kits provide a complete set of tools to either evaluate the eZ80F91 or the eZ80F92/3 devices or to develop a variety of new applications including vending machines, point of sale, security, automation, communication, industrial control, facility monitoring and remote control. Each kit features two primary boards: the eZ80® Development Platform and the eZ80F91 Module or eZ80F92 Flash Module. In addition, all the necessary hardware, software, and technical documentation are included in the kit for design to begin immediately.

Development Kit Contents

Hardware

-eZ80® Development Platform
-eZ80F91 Module or eZ80F92 Flash Module
-Ethernet Hub (eZ80F91 only)
-ZPAK II Emulator
-ZDI Target Interface Module
-Universal Power Supplies
-Cables

Software

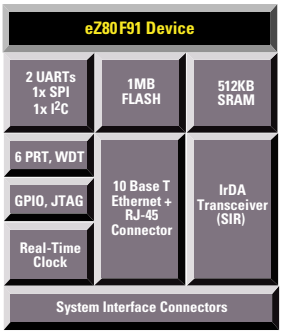
-ZDS II Integrated Development Environment (IDE)
-ANSI C-Compiler
-Sample Software Projects

Documentation/CD-ROM

-Quick Start Guide
-Development Kit User Manual
-ZDS II User Manual
-ZPAK II User Guide
-eZ80® CPU User Manual
-Product Specifications
-Product Briefs

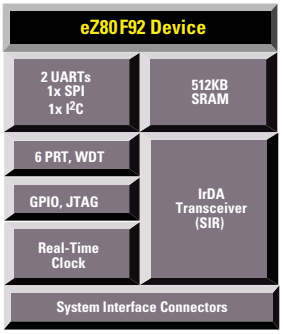
CPU Modules

Three different modules powered by the new eZ80Acclaim!™ Flash MCUs are offered as stand-alone development tools to aid with application design. These compact, high performance modules have been created for the rapid deployment of embedded systems.



eZ80F91 Module (Included in eZ80F91 Kit)

The eZ80F91 module features the eZ80F91 device operating at 50MHz with 256KB on-chip Flash memory and 16KB of internal SRAM. An additional 512KB of off-chip SRAM, 1MB of Flash, and a 10BaseT Ethernet Controller with a RJ-45 connnector are also provided.



eZ80F92 Flash Module (Included in eZ80F92 Kit)

The eZ80F92 Flash Module features the eZ80F92 device operating at 20MHz with 128KB on-chip Flash memory and 8KB of internal SRAM and an additional 512KB of off-chip SRAM.

In addition to the features of the eZ80F92 Flash module, the eZ80F92 Ethernet module highlights 512KB off-chip SRAM, 1MB Flash, and a 10BaseT Ethernet Controller with a RJ-45 connnector.

ZiLOG™

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ZiLOG eZ80F91 Development Kit

Development Platform

The eZ80® development platform has been designed to accept application-specific modules as well as Z8- and eZ80®- based add-on modules. It can operate in stand-alone mode with Flash memory, or interface via ZPAK II Emulator to a host PC running ZDS II IDE software.

Featuring up to 2MB fast SRAM, the eZ80® development platform has the following major hardware blocks:

- -Module Interface
- -Application module interface
- -User GPIO latches and LED matrix
- -RS-232 serial communications ports
- -Embedded modem interface
- -I²C devices
- -Power connector

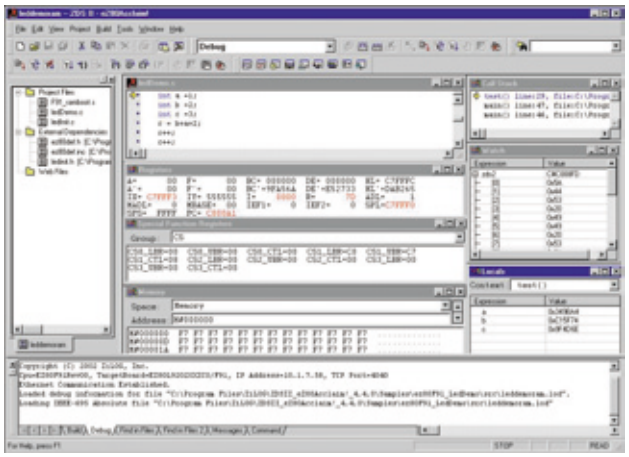
ZDS II IDE

ZiLOG Developer Studio II Integrated Development Environment is a complete suite of software tools that supports development with the eZ80® family of microcontrollers. Combining an easy-to-use Windows-based GUI with multithreading capability, ZDS II provides an environment that simplifies code compilation and development. Included in ZDS II are a language sensitive editor, project manager, compiler, assembler, linker, librarian, and debugger.

ZPAK II Emulator

ZPAK II is a complete debug package for eZ80® microcontrollers equipped with on-chip emulation support hardware. It serves as a physical link between ZDS II and the target system. This allows users to download code directly to the target system for editing and debugging purposes.

www.zilog.com



C-Compiler

A full version ANSI C-Compiler is included in this kit at no additional cost. Simplify application software development and reduce time-to-market. The C-compiler supports a powerful configurable optimizer allowing code to be optimized for speed or size.

Ordering Information

eZ80F91 Development Kit
Part #: eZ80F910200ZCO
Description: Complete development kit with eZ80F91 module, Ethernet hub, C-Compiler, development platform, ZPAK II Emulator

eZ80F92 Development Kit
Part #: eZ80F920200ZCO
Description: Complete development kit with eZ80F92 Flash module, C-Compiler, development platform, ZPAK II Emulator

eZ80F91 Module (Optional)
Part#: eZ80F915050MOD
Description: eZ80F91 device, 50MHz operation, 512KB SRAM, 1MB Flash, Ethernet interface

eZ80F92 Flash Module (Optional)
Part #: eZ80F920020MOD
Description: eZ80F92 device, 20MHz operation, 512KB SRAM

eZ80F92 Ethernet Module (Optional)
Part #: eZ80F920120MOD
Description: eZ80F92 device, 20MHz operation, 512KB SRAM, 1MB Flash, Ethernet interface

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Z8 Encore!® Microcontroller

ZiLOG Developer Studio II

Product Brief

PB009706-0405

ZiLOG Developer Studio II

Introduction

ZiLOG Developer Studio II (ZDS II) Integrated Development Environment is a complete stand-alone system that provides a state-of-the-art development environment. Based on standard Win98 Second Edition, WinNT 4.0 Service Pack 6, Win2000 Service Pack 3, WinXP Service Pack 1 user interfaces, ZDS II integrates a language-sensitive editor, project manager, C-Compiler, assembler, linker, librarian, and source-level symbolic debugger to provide a development solution specifically tailored to the Z8 Encore!® line of microcontrollers.

ZDS II Products Integrated for the Z8 Encore!®

Assembler	ez8asm
Compiler	ez8cc
Linker	ez8link
Librarian	ez8lib
Simulator	Yes
Host Communication	RS-232, USB

Figure 1 illustrates a typical display interface showing many of the features of ZDS II.

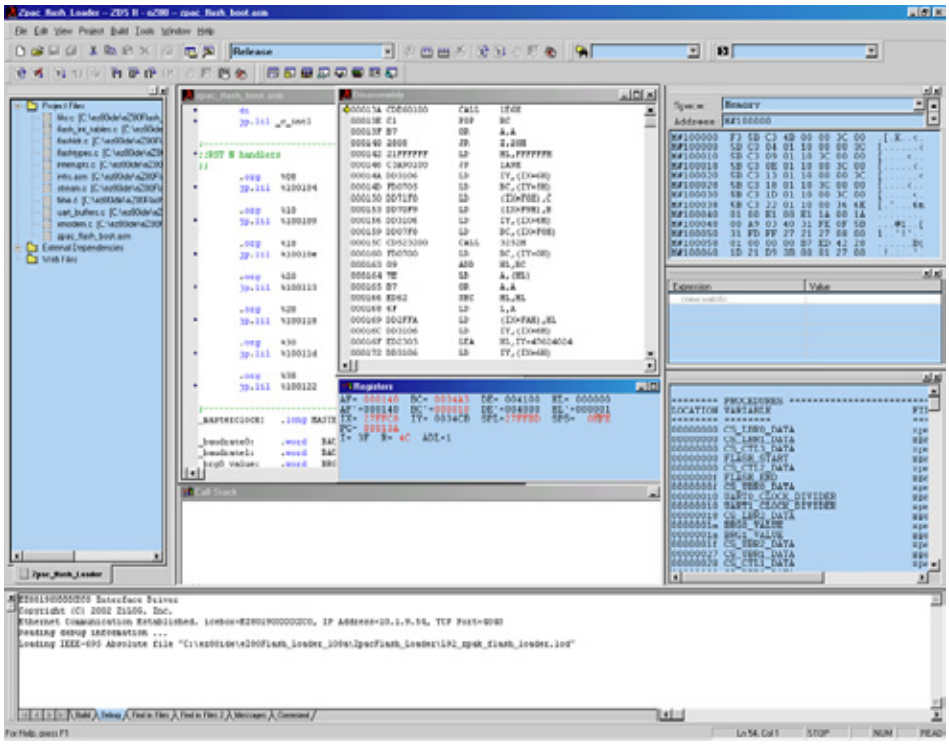

Figure 1. ZDS II's Easy-To-Use Interface

Easy-To-Use Interface

ZDS II provides a standard user interface with intuitive, easy-to-use controls commonly found in Windows®-based environments. The system contains an integrated set of windows, document views, menus, and toolbars to create, test and refine applications without having to alternate between different systems.

Flexible and Adaptable Design Capabilities

Designed to use the multithreading capability of the host operating system, multiple operations can be performed efficiently and easily with ZDS II. Working in this type of multitasking environment allows file editing while simultaneously compiling code.

Save Valuable Time

The basic components of ZDS II are an assembler, eZ8 C-Compiler, linker, debugger, and editor. Each of these modules plays an important role in helping a developer compile a product in record time.

Combining a simple interface and flexible design elements results in full command of design applications and quick time-to-market.

Features

- Integrated Project Management—create, add, or remove project files
- Create and edit source files
- *Find/Find in Files/Replace* capabilities
- Optimizing ANSI eZ8 C-Compiler
- Compile, Build, and Rebuild All capabilities
- Download, Execute, Debug, and Analyze
- Language-sensitive editor
- Symbolic source-level debugging for C and assembly languages
- Online Help
- Version Control
- Full-featured assembler and linker
- Interleaved source and disassembly
- Makefile generation
- Scripting language

Specifications

- ZiLOG Developer Studio (ZDS II)
- Configurable settings for:

CPU	Target
Compiler	Debugger
Assembler	Emulator
Linker	Simulator

- Debugger:
  - Source level, symbolic assembly debugging
  - eZ8 C-Compiler
- Supported ZiLOG processor family: ZiLOG's Z8 Encore!® Microcontrollers
- Host operating systems: Win98 Second Edition, WinNT 4.0 Service Pack 6, Win2000 Service Pack 3, WinXP Service Pack 1
- Supported hardware: ZiLOG Z8 Encore!® Microcontroller Emulators

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IDE Window Details

ZiLOG ZDS II features several windows that allow viewing various aspects of ZDS II tools while working with a project.

Project Workspace Window

The Project Workspace window displays project files. It uses a graphical hierarchy to display a project's source, dependency, and object files. This graphic tree displays separate folders for source, web, and dependency files. These files display in the Project Workspace window when the project is first opened.

Editor Window

The Editor window allows viewing and editing of the files in a project. It includes a chroma-code language-sensitive editor that displays instructions, comments, and assembler directives in different colors. It also includes built-in search capabilities. Double-click on an error message in the output window to find the line containing the error.

Output Windows

Use the Output windows to view comments and errors when building or compiling a project. Output windows contain tabs for Build, Debug and Find, Message, and Command Output functions. The Build tab displays the results of the assembler/linker process. The Debug tab displays error messages during the Debug and Build processes. The two Find files hold the results of the Find in Files Command, depending on which Find in Files tab the user chooses. The Messages Output window displays informational messages intended for the user. The Command Output window displays all text messages and output generated by the ZDS II IDE as it executes commands.

Status Bar

The Status Bar displays the current status of program execution. Status messages include STOP, STEP, and RUN. STOP mode halts the program. STEP mode allows Step Into, Step Over, and Step Out commands.

Debug Windows

ZDS II features several specialized windows that allow viewing information that helps to debug applications. These windows are only available when running in Debug mode. Select the Debug Windows submenu and the name of the Debug window or click on the appropriate Debug window's icon in the toolbar. Figure 2 illustrates the Debug Window.

Developers can use the following commands and tools:

- Go, Break, Reset, Step Into, Step Over, Step Out, and Set Next Instruction commands
- Run or Jump to Cursor commands
- Downloading code to ZiLOG emulators
- Inserting or removing breakpoints
- Enable/Disable (All) breakpoints

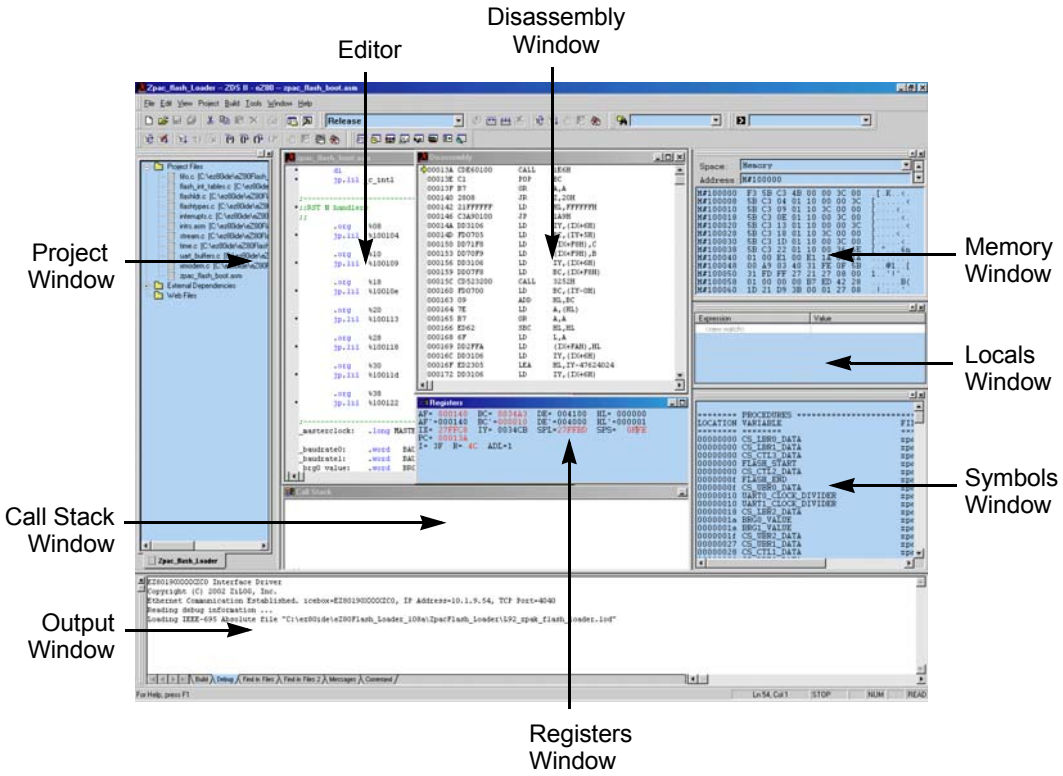

Figure 2. Debug Windows—Example

Table 1 lists the Debug windows and functions.

Table 1. Functions of the Debug Window

Debug Window	Function
Registers	Displays the contents of all registers.
Clock	Displays the number of states executed since the last reset.
Memory	Displays data located in program memory.
Watch	Displays all the variables and their values defined using the WATCH command. If the variable is not in scope, the variable is not displayed.
Locals	Displays all local variables that are currently in scope.
Call Stack	Displays the functions whose frames have been pushed onto the stack.
Symbols	Displays the address for each symbol in the program.
Disassembly	Displays the assembly code associated with the code displayed in the Code window. For each line in this window, the address location, the machine code, the assembly instruction and its operands display.
Special Function Registers	Displays the contents of the special function registers for the selected target.

eZ8 C-Compiler

Introduction

The eZ8 C-Compiler is an optimizing ANSI C-Compiler. The eZ8 C-Compiler meets ANSI's definition of a *freestanding implementation* (code can be developed for another machine), with the exception that *doubles* (object types) are 32 bits. In accordance with the definition of a freestanding implementation, the compiler accepts programs which confine the use of the features of the ANSI standard library to the contents of the standard headers: `<float.h>`, `<limits.h>` and `<stddef.h>`. This release supports more of the standard library than is required of a freestanding implementation.

The compiler runs on the Windows®Win98 Second Edition, WinNT 4.0 Service Pack 6, Win2000 Service Pack 3, WinXP Service Pack 1 operating systems and can be invoked either through the command line or within the ZiLOG Developer Studio Integrated Development Environment. There are several language extensions supported in this version of the compiler, including interrupt functions and memory space accesses.

Figure 3 illustrates an example of the eZ8 C-Compiler development flow.

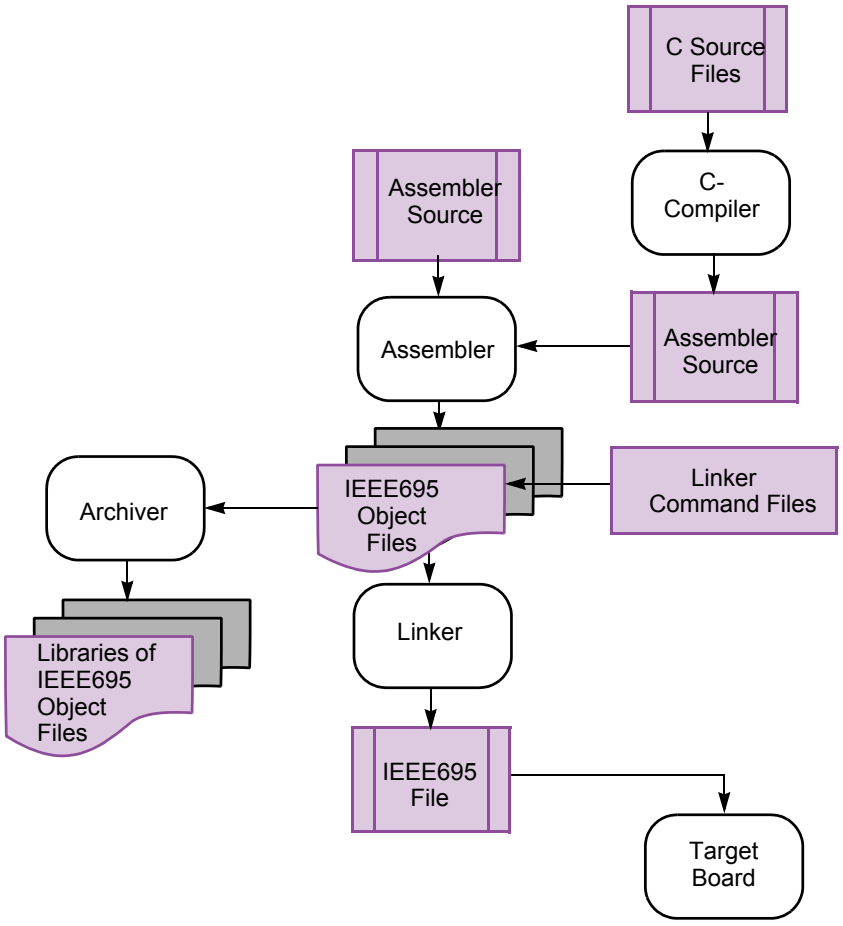

Figure 3. C-Compiler Development Flow

Software Features

- Highly optimized ANSI C-Compiler
- ANSI C run time library
  - String manipulation
  - Character classification and conversion
  - Buffer manipulation
  - Data conversion
  - Floating point and trigonometric functions
- Single precision IEEE floating point support
- Extensions for interrupt service routines
- Support for in-line assembly
- Intrinsic functions that are in-line expanded
- Copies initialized data from ROM to RAM
- The compiler, assembler, linker, and librarian can be used within ZDS or individually on the command line
- Optimizations:
  - Constant folding
  - Constant propagation
  - Copy propagation
  - Common sub-expression elimination

Supported Host System Configuration

- Win98 Second Edition, WinNT 4.0 Service Pack 6, Win2000 Service Pack 3, WinXP Service Pack 1
- PentiumII, 233MHz processor or higher up to Pentium IV, 2.8 GHz
- 96MB RAM or more
- 25MB hard disk space or more
- Super VGA video adapter
- CD-ROM
- One or more RS-232 communication ports
- USB

Supported ZiLOG Processor Families

ZiLOG Z8 Encore!®

Technical Support

- email: www@zilog.com
- Toll-free telephone, U.S.: 1.877.945.6427
- International telephone: 512.306.4067
- Facsimile: 512.306.4072

Distribution Contents

- C-Compiler
- Assembler, linker and archive executables
- Header files
- Libraries
- Sample files and/or projects
- C-Compiler user manual in PDF format
- Release documentation with change logs
- ZDS configuration files

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